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B. Document Number: DOE/RL-96-101, Revision 2

C. Title: Radioactive Air Emissions Notice of Construction Fuel Removal for 105-KE Basin

D. Internet Address:

E. Required Information

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D. J. Watson
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H. Author/Requestor

D. J. Watson 9-19-01
(Print and Sign)

Responsible Manager

D. P. Kimball for DPK per telecon
(Print and Sign)

I. Reviewers

	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	☐			Y / N
Office of External Affairs	☐			Y / N
DOE-RL N/A per telecon	☒			Y / N
Other LMSI	☑	C. Willingham	Chris Willingham	(Y) / N
Other	☐			Y / N

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Information Clearance Approval

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A-6001-401 (12/00)

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DOE/RL-96-101
Revision 2

Radioactive Air Emission Notice of Construction Fuel Removal for 105-KE Basin

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management
Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

DOE/RL-96-101
Revision 2

Radioactive Air Emission Notice of Construction Fuel Removal for 105-KE Basin

Date Published
September 2001

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

Chris Williamson 9/20/01
Release Approval Date

Approved for public release; further dissemination unlimited

DOE/RL-96-101, Revision 1 was transmitted to regulatory agencies for review on July 26, 2001, letter number 01-RCA-378. Per comments received, Revision 2 is being released in lieu of Revision 1 to maintain distinction between that document transmitted for review/approval and that which incorporated comments received.

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APPENDICES

FIGURES

TABLES

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TERMS

ALARA	as low as reasonable achievable
CFR	Code of Federal Regulations
CVDF	Cold Vacuum Drying Facility
DOH	Washington State Department of Health
Ecology	Washington State Department of Ecology
FRS	fuel retrieval system
HEPA	high-efficiency particulate air
IXM	ion exchange module
MEI	maximally exposed individual
MCO	multi-canister overpack
NOC	notice of construction
PTE	potential to emit
RCRA	*Resource Conservation and Recovery Act of 1976*
SEPA	(Washington) *State Environmental Policy Act of 1971*
SNF	spent nuclear fuel
SNM	special nuclear material
SPR	single pass reactor
TEDE	total effective dose equivalent
WAC	Washington Administrative Code
Ci	curies
Ci/day	curies per day
Ci/yr	curies per year
C°	degrees Celsius
Kg	kilogram
Kpa	kilopascal
mrem	milliroentgen equivalent man
MTU	metric tons of uranium
rem	roentgen equivalent man
µCi/ml	microcuries per milliliter
µCi/L	microcuries per liter

METRIC CONVERSION CHART

The following conversion chart is provided to the reader as a tool to aid in conversion.

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
square miles	259	hectares	hectares	0.00391	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			**Volume**		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

1.0 INTRODUCTION

This document serves to modify the Notice of Construction (NOC) submitted to the Washington State Department of Health (DOH) and the U.S. Environmental Protection Agency (EPA) per References DOE/RL 1997a and DOE/RL 1997b respectively. The purpose of this NOC modification is to describe changes in the process by which the spent nuclear fuel (SNF) will be removed from the 105 KE Basin. Table 1-1 is a brief summary description of the sections of this NOC and their modifications associated with these process changes, pursuant to the requirements of Washington Administrative Code (WAC) 246-247-060, and as a request for approval to construct pursuant to the *Comprehensive Environmental Response and Compensation Liability Act* Record of Decision for the K Basins Interim Remedial Action (DOE/RL 1999) for the modifications, installation of new equipment, and fuel removal and sludge relocation activities at 105 K East (KE) Basin.

The 105 KE reactor and its associated SNF storage basin (105 KE Basin) were constructed in the early 1950s and are located in the 100 K Area about 1,400 feet from the Columbia River. The 105 KE Basin contains 1,152 metric tons of SNF stored under water in 3,673 open canisters. This SNF has been stored since it was discharged from N Reactor between 1975 and 1987. The 105 KE Basin is constructed of unlined concrete and contains approximately 1.3 million gallons of water with an asphaltic membrane beneath the pool. The fuel is corroding and an estimated 1,700 cubic feet of sludge, containing radionuclides and miscellaneous materials, have accumulated in the basin.

The 105 KE Basin has leaked radiologically contaminated water to the soil beneath the basin in the past, most likely at the construction joint between the foundation of the basin and the foundation of the reactor.

The purpose of the activities described in this NOC modification is to enable the removal and transport of the SNF to the 105 K West (KW) Basin for further processing. This NOC describes modifications, the installation of new equipment operations.

Construction for proposed modifications are scheduled to begin in calendar year 2001.

Table 1-2 contains a record of the original NOC and subsequent revisions, including regulatory approvals. Those portions of the NOC which have been revised since the issuance of DOE/RL-96-101, Radioactive Air Emissions Notice of Construction Fuel Removal for 105 KE Basin, are noted by a vertical bar in the right-hand margin.

This NOC also identifies a potential-to-emit (PTE) associated with the 100 Area Diffuse/Fugitive Emission Unit per the direction in reference DOH 2001. This PTE is attributed to the transportation of non-sealed radioactive sources from the 105 KE Basin.

Table 1-1. Summary of NOC Modifications.

Section	Title	Nature of Modifications
1.0	Introduction	
2.0	Facility Location	No change
3.0	Responsible Manager	Change in personnel
4.0	Type of Proposed Action	No change, remains an insignificant modification.
5.0	State Environmental Policy Act	No change.
6.0	Process Description	Revised fuel removal system description.
7.0	Annual Possession Quantity and Physical Form	Revised to acknowledge F & H Reactor fuel receipt.
8.0	Control System	Added controls for passive vents associated with new fuel cask and overpack.
9.0	Monitoring System	No change
10.0	Release Rates	Added release rates for water transfer and shielded transfer cask. Added 100 Area Diffuse/ Fugitive Emission Unit.
11.0	Offsite Impact	Added impact from water transfer and shielded transfer cask. Added 100 Area Diffuse/ Fugitive Emission Unit.
12.0	Facility Lifetime	Added completion date for the removal of fuel, sludge, debris, and water.
13.0	Technology Standards	Revised to address each technology standard cited in WAC 246-247-120.
14.0	References	Updated.
Appendix A	Discussion of As Low As Reasonably Achieveable Control Technology	No change.
Appendix B	105 KE and 105 KW Fuel Storage Basins ALARACT Demonstration for Receipt and Storage of F and H Reactor Fuel	Newly added appendix.
Appendix C	105 KE Basin ALARACT Demonstration for IWTS Concrete Pad Removal	Newly added Appendix.

Table 1-2. Fuel Removal NOC Record of Revision.

Date	Document	Remarks	Approvals	
			WDOH	EPA
2/97	Notice of Construction Fuel Removal for 105KE Basin DOE/RL-96-101, Rev. 0		a	b
9/98	Routine Technical Assistance Meeting, September 15, 1998	Return of SNF from 327 Building to 105 KE Basin	c	
3/7/00	Hanford Facility NOC Revision Form, Debris Removal Description	Allowed debris to be sprayed with fixative	d	d
2/20/01	105 KE Fuel Storage Basin ALARACT Demonstration for IWTS Concrete Pad Removal	Concrete pad removal north side 105KE Basin	e	e
3/7/01	NOC Application Permit Revision, Sampling Frequency and Turnaround Time	DOH approval condition change request	f, g	
4/23/01	Receipt & storage of F & H Reactor fuel at 105 KE or 105 KW Basins (ALARACT)	Allowed the receipt and storage of F & H reactor fuel at the basins.	h	i

(a) Washington State of Washington Department of Health approval letter, A. W. Conklin to J. E. Rasmussen, AIR 97-206, dated 3/5/97.
(b) Environmental Protection Agency approval letter, A. J. Frankel to J. E. Rasmussen, dated 4/22/97.
(c) Signed Routine Technical Assistance Meeting meeting minutes, dated 9/21/98.
(d) NOC Revision Form approved by A. W. Conklin, dated 3/7/00, approved by L. E. Godbois (EPA), dated 3/6/00.
(e) ALARACT demonstration concrete pad removal approved by R. Aeselrod dated 2/20/01, and approved by L.E. Godbois (EPA) per telecon.
(f) NOC Application/Permit Revision approved by A. W. Conklin, dated 3/7/01.
(g) AIR-01-504, approved by A. W. Conklin, dated 5/14/01.
(h) AIR-01-403, approval by A. W. Conklin, dated 4/23/01.
(i) EPA approval attached to DOE-RL letter to EPA, P. G. Loscoe to D. R. Sherwood, 01-SFO-064, dated 4/5/01.

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2.0 FACILITY LOCATION (REQUIREMENT 1)

The 105 KE Basin is located within the 105 KE Reactor structure in the 100 K Area of the Hanford Site. The 100 K Area is approximately 25 miles northwest of the city of Richland, Washington. Figure 2-1 shows the location of the 100 K Area and Figure 2-2 shows the location of both basins within the 100 K Area.

There are four roof exhausters in 105 KE Basin. The Washington State Plane Coordinates for these points are as follows:

P-105KE-1	Latitude:	146722 N	Longitude:	569150 E
P-105KE-2	Latitude:	146728 N	Longitude:	569149 E
P-105KE-3	Latitude:	146735 N	Longitude:	569170 E
P-105KE-4	Latitude:	146742 N	Longitude:	569187 E

Address: U.S. Department of Energy, Richland Operation Office
Hanford Site
100 K Area, 105 KE and KW Basins
Richland, Washington 99352

Figure 2-1. Location of the 100-K Area within the Hanford Site.

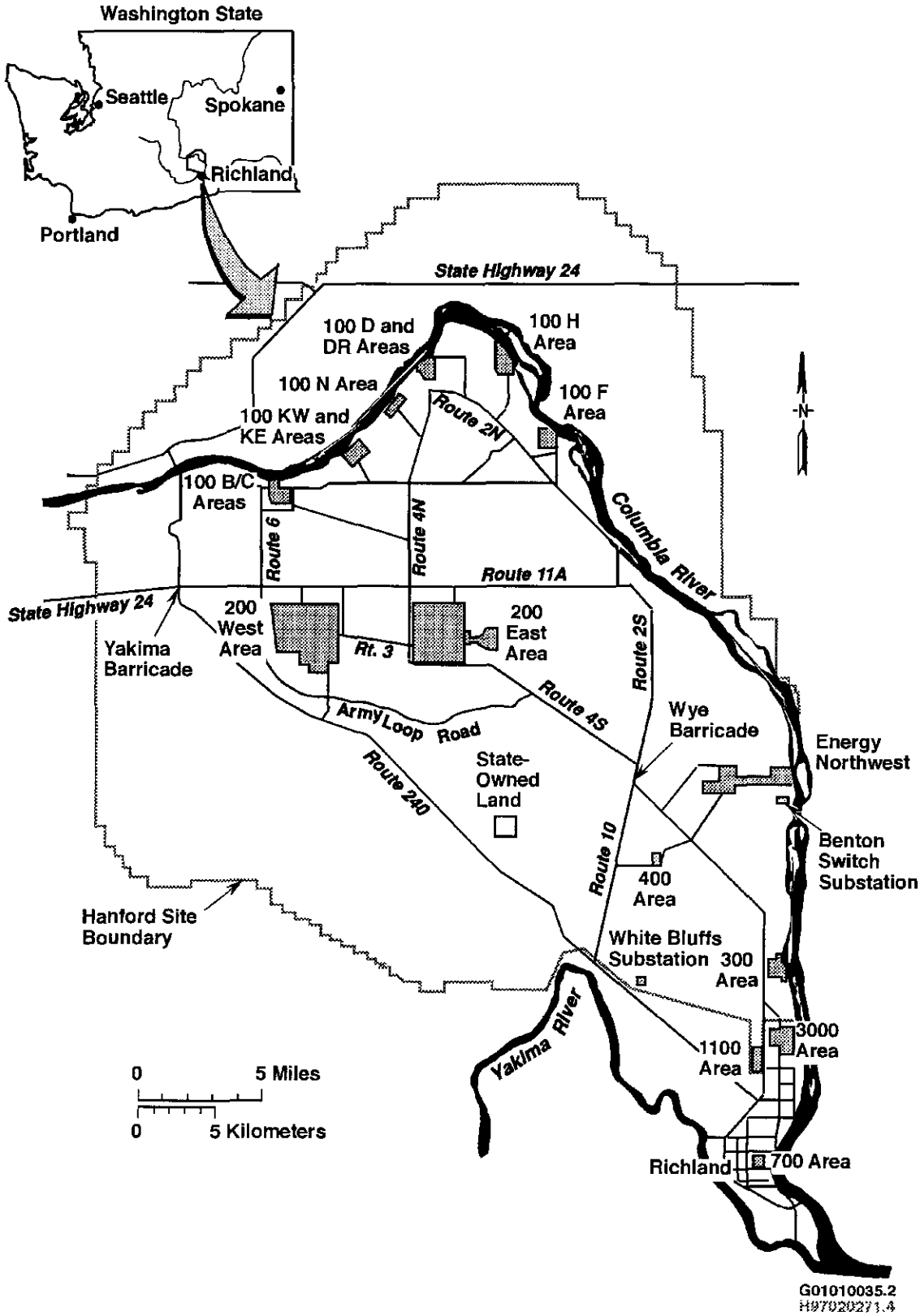
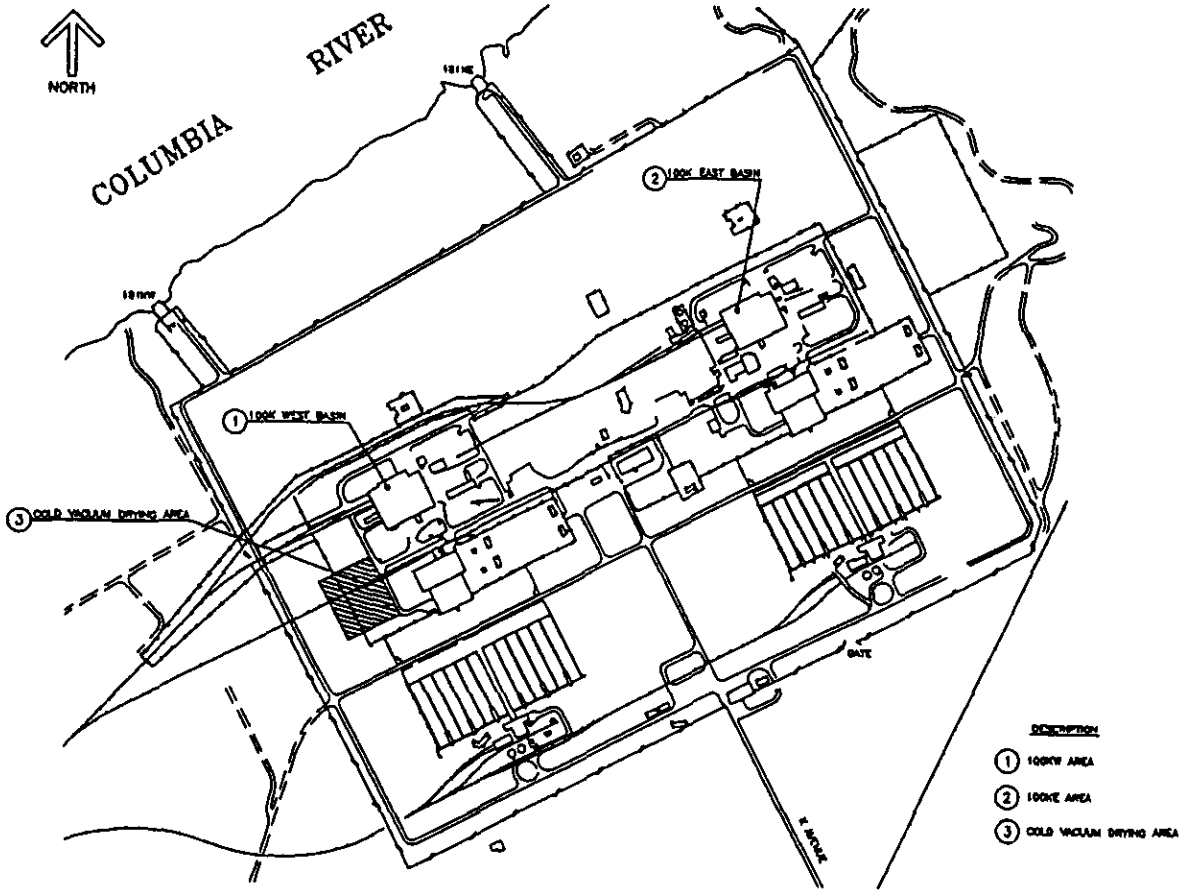


Figure 2-2. Location of Both Basins within the 100-K Area.



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3.0 RESPONSIBLE MANAGER (REQUIREMENT 2)

The responsible manager's name and address are as follows:

S. J. Veitenheimer, Director
Office of Spent Nuclear Fuels
U.S. Department of Energy
Richland Operations Office
Mail Stop A4-79
P.O. Box 550
Richland, WA 99352
(509) 373-9725

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4.0 TYPE OF PROPOSED ACTION (REQUIREMENT 3)

The proposed action consists of the installation, operation, and maintenance of fuel removal and sludge relocation equipment; the transport of fuel and any residual sludge on the fuel in shielded transfer cask/overpacks to the 105 KW Basin; as well as debris removal, minor basin modifications, and pumping/transport of low-level contaminated water to and from the 105 KE Basin.

This proposed action is not considered a significant modification to the existing basin and operations at the 105 KE Basin in accordance with WAC 246-247-030 (16) and (25).

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5.0 STATE ENVIRONMENTAL POLICY ACT (REQUIREMENT 4)

The proposed activity is categorically exempt from the State Environmental Policy Act (SEPA) of 1971 per WAC 197-11-845(1).

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6.0 PROCESS DESCRIPTION (REQUIREMENTS 5 AND 7)

Fuel storage operations at the 105 K East (KE) Basin have been continuous since 1975. The 105 KE Basin is a rectangular, reinforced concrete basin measuring 125 feet long by 67 feet wide by 21 feet deep with three main storage bays separated by concrete partitions open at each end, two loadout pits, viewing pits, and a discharge chute. At the west end (i.e., transfer area) there are large rollup doors that provide access for moving materials in and out of the basin. A 24-ton bridge crane is also located in the transfer area for lifting objects out of the basin. Metal grating is suspended over the entire basin, 21 feet above the basin floor (five feet over the nominal water level) to provide a working surface from which operators maneuver the fuel canisters. Canisters are moved by using a hoist and monorail system that runs throughout the 105 KE Basin.

The main storage bay floor is equipped with racks designed to house fuel canisters. The canisters are stored directly on the basin floor, surrounded by storage racks that maintain the canisters upright, in a fixed geometric array. The existing canisters consist of two cylinders approximately nine inches in diameter by 28 inches tall, made of aluminum or stainless steel, and are joined by trunnions to facilitate handling. A canister can hold a maximum of 14 N Reactor fuel elements.

The water level of the 105 KE Basin is maintained at approximately 16 feet deep to cool the fuel and to provide radiological shielding for personnel. To maintain low concentrations of radionuclides, the water is circulated through a closed-loop water treatment system. A detailed description of this system is provided in Section 6.3. The general layout of the Fuel Transfer System (FTS) is shown in Figures 6-1, 6-2, and 6.3. The basin water level in relation to the stored fuel is shown in Figure 6-4.

The fuel retrieval process will be conducted under water. The process will encompass placing up to 10 canisters into a Shielded Transfer Cask (STC) underwater (Figure 6-2). Underwater operations involve the use of hoists and lifting tools similar to those used in the past in moving canisters underwater in the basin to move fuel canisters to the dummy elevator pit and place them into the STC. Basin water quality will be controlled by the existing water treatment system.

Following this, the STC lid will be closed under water. The STC will be removed out of the basin pool by way of an underwater lift system in the dummy elevator pit area. The STC will then be rolled into the Cask Transfer Annex be placed into a cask transfer overpack (CTO), thereby isolating any surface contamination from the environment. The STC/CTO will then be transferred by a crane to a transfer tractor trailer. The STC/CTO will be transferred to the 105 KW Basin where it will be unloaded. Once unloaded, the STC/CTO is returned to the 105 KE Basin for the next loading repeating the process just described until all the canisters loaded with SNF are removed. Any residual sludge in the STC may be transferred by moving it to an under water sludge accumulation area.

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Figure 6-1. Fuel Transfer System.

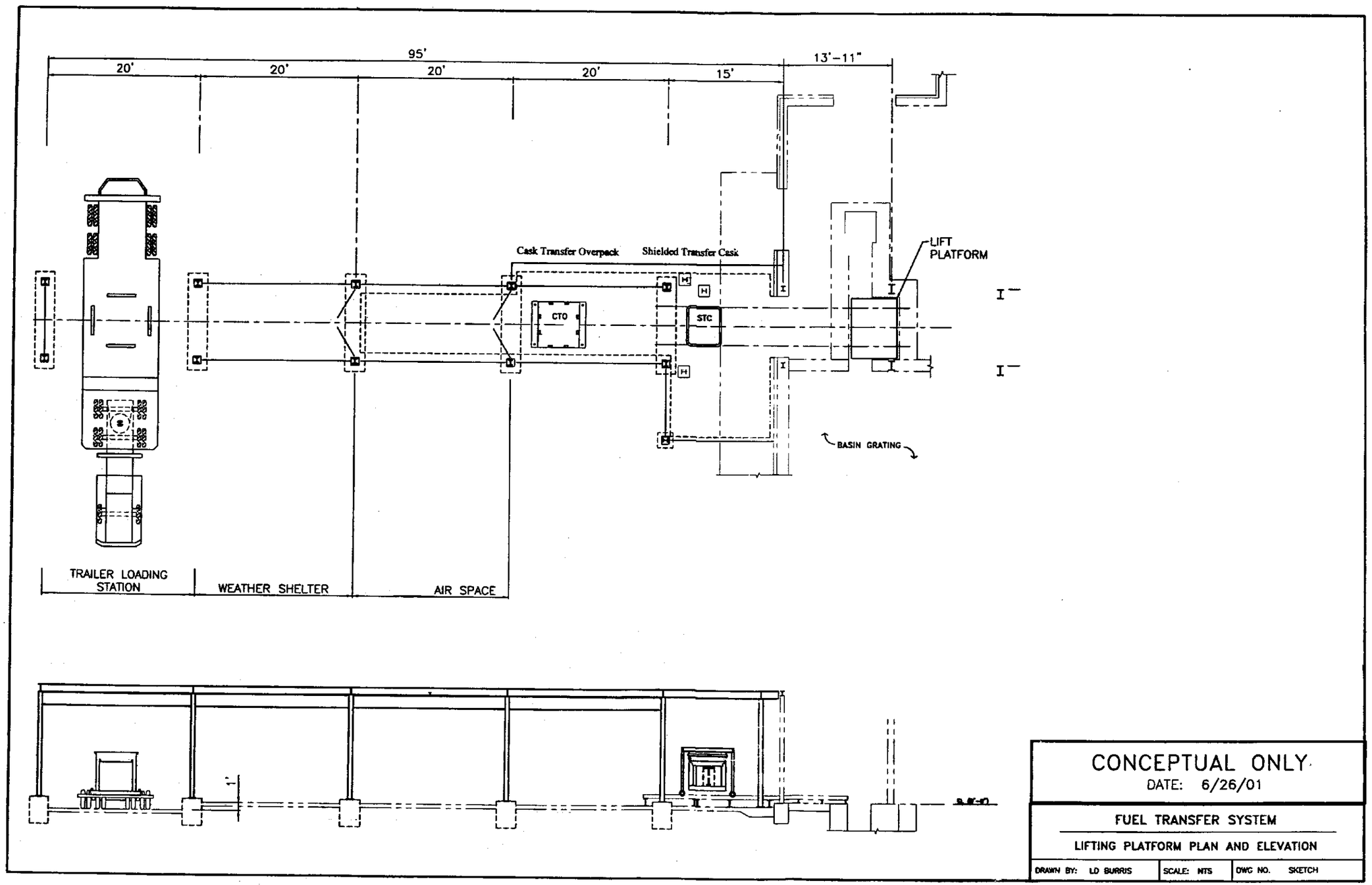


Figure 6-2. Fuel Transfer System Lifting Platform 105 KE.

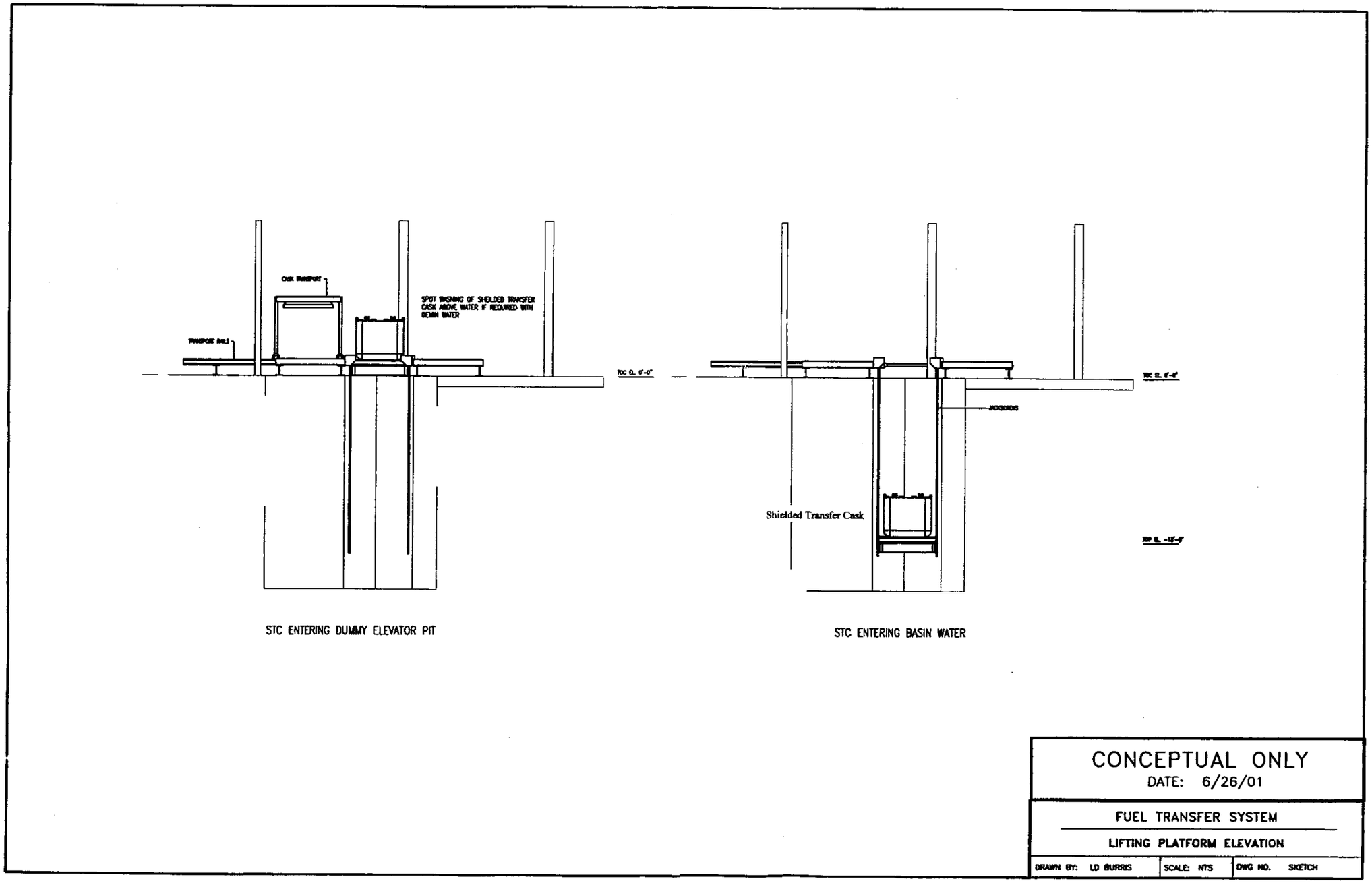
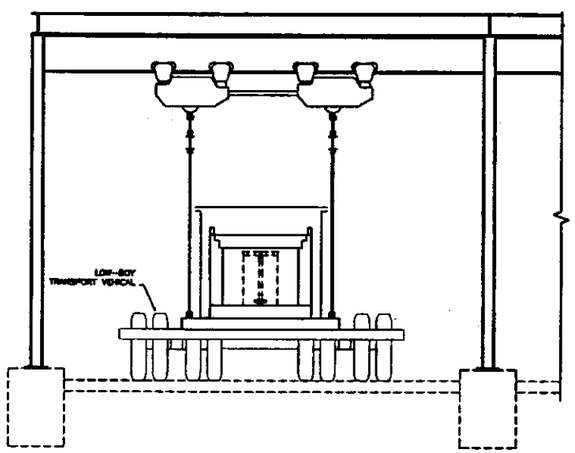
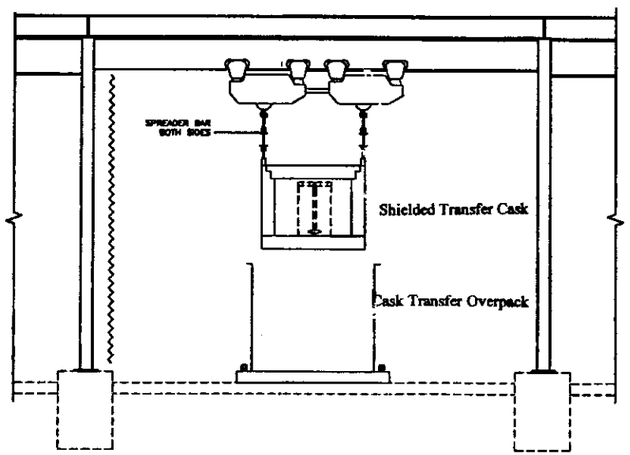


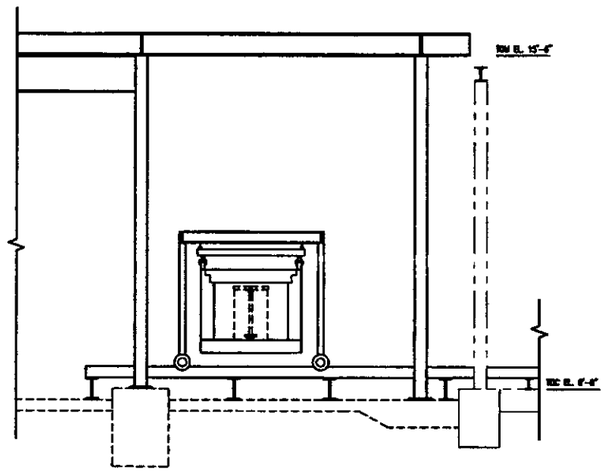
Figure 6-3. Fuel Transfer System
Lifting Cask Transfer Annex.



TRANSPORT VEHICLE
CTO/STC



STC PLACED)/REMOVED FROM CTO



STC ON TRANSPORT DOLLEY

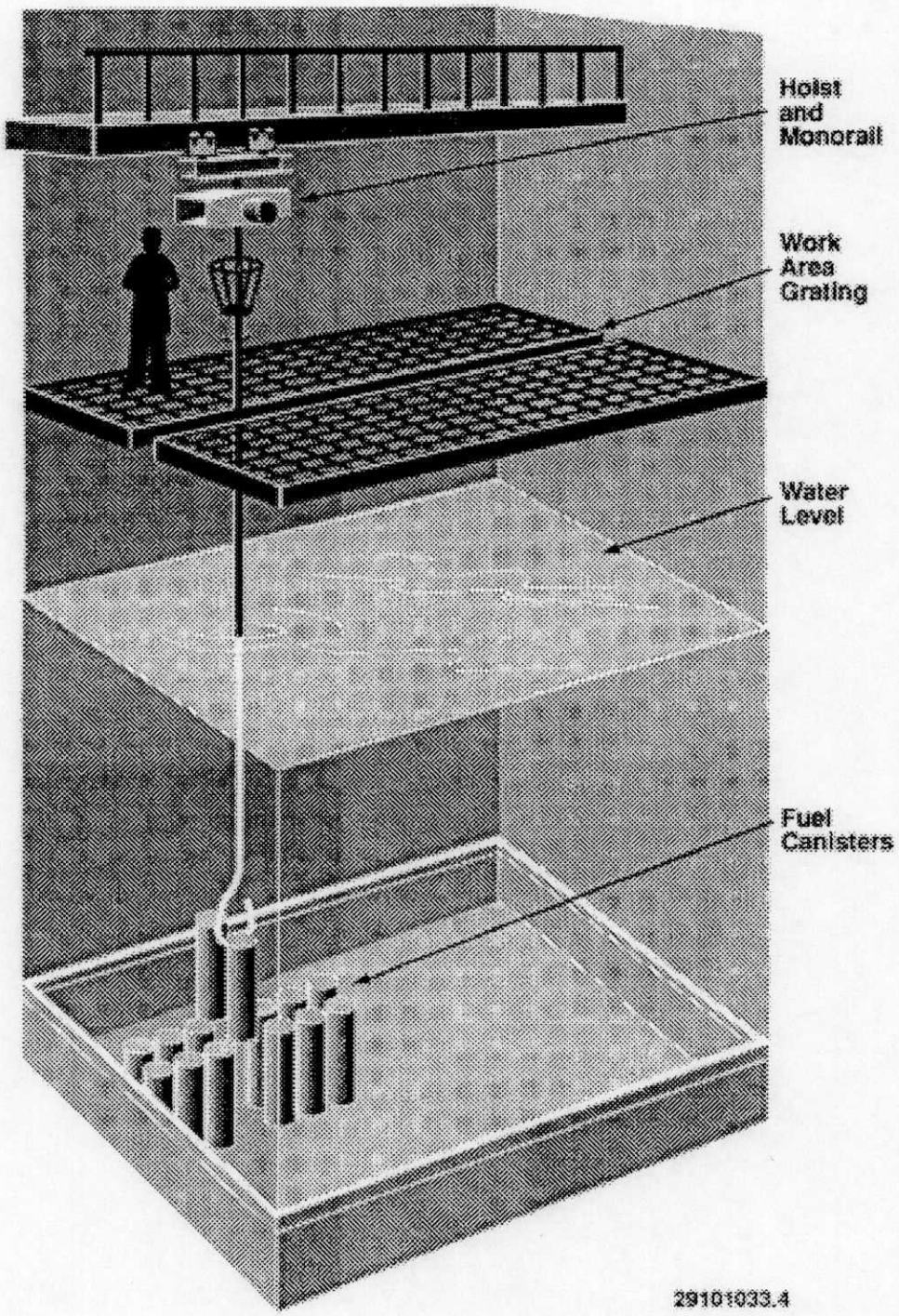
CONCEPTUAL ONLY
DATE: 6/26/01

FUEL TRANSFER SYSTEM

LIFTING PLATFORM ELEVATION

DRAWN BY: LD BURRIS	SCALE: NTS	DWG NO. SKETCH

Figure 6-4. The Basin Water Level in Relation to the Stored Fuel.



The proposed construction activities largely involve the installation of uncontaminated (new) equipment in the basin, portions of which will be placed under water on the floor of the basin and portions that will be installed above water. An enclosed structure (Cask Transfer Annex) will be constructed onto the basin building as shown in Figures 6-1 through 6-3 that will be used to remove the STC from the basin building, place the STC into a CTO, and then place the STC/CTO onto a tractor trailer for transfer to the 105 KW Basin. The STC/CTO will return to 105 KE Basin through this annex.

6.1 FUEL RETRIEVAL SYSTEM

The fuel retrieval system (FRS) will retrieve fuel canisters throughout the basin using the existing system of ovehead hoists and lifting tools and position those canisters at the dummy elevator pit.

Major components of the FRS include the monorail hoists, long handled tongs, and cameras and lighting.

- Monorail Hoist–The 105 KE Basin has an existing monorail system for the underwater handling of fuel canisters and equipment.
- Long-handled or similar tools–The underwater tools will be used to handle canisters, move canisters, and remove debris from the basin water.
- Cameras and Lighting–Underwater closed-circuit television cameras and related lighting will be provided to support underwater operations.

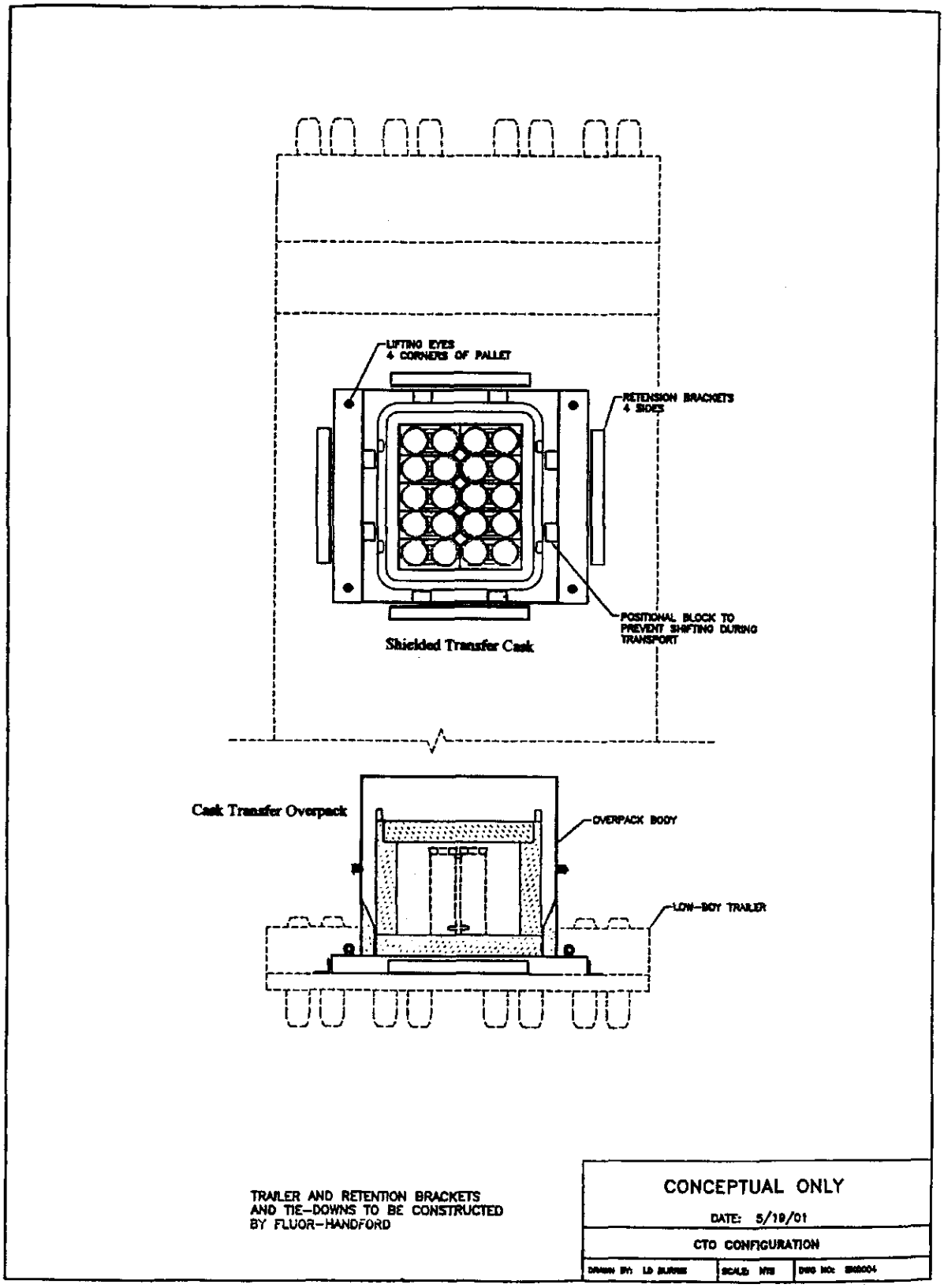
6.2 SHIELDED TRANSFER CASK LOADOUT SYSTEM

After canisters are moved underwater to the dummy elevator pit they will be placed into the STC using the existing monorail system. After the STC is loaded, the lid will be secured to the STC under water. The STC will then be raised out of the water using an underwater lift system and sprayed with either demineralized water or IXM outlet water to reduce the smearable contamination levels on the STC exterior surfaces. The return of the unloaded STC from 105 KW Basin will follow the same process but in reverse. The unloaded STC from 105 KW Basin may contain radiologically contaminated water when it is returned to the 105 KE Basin.

The major components of the STC loadout process are:

- STC–The STC (Figure 6-5) consists of a fabricated metal body with a mechanical lid. The design is engineered to reduce radiation levels on the exterior of the cask which is required to maintain occupational radiation levels As Low As Reasonably Achieveable (ALARA) when it is removed from the basin water. The overall dimensions of the STC are approximately 5'3" long by 4'6" wide and 3'8" in height.

Figure 6-5. Cask Transfer Overpack/Shielded Transfer Cask Configuration.



The basic components of the STC are the STC body and lid. The STC lid is secured to the cask body mechanically. There are penetrations in the STC lid for venting any hydrogen gas that may be generated and for draining the STC. The vent will be equipped with a metal HEPA type filter. The STC closure lid will have a locking mechanism. Lifting trunnions or lugs are provided for engagement with the lifting system.

- Cask Transfer Overpacks–The CTO (Figure 6-5) consists of a fabricated metal body with a mechanical lid. The CTO is used to house the STC after it has been removed from the basin and isolate any smearable contamination on the STC exterior from the environs during handling and shipment. The CTO is approximately 6'1" long by 5'4" wide and 4'2" in height. There are penetrations in the CTO lid for venting any hydrogen gas that may be generated. The vents will be equipped with a Nuc Fil®[1] filter or a metal HEPA type filter.

- Conveyance Vehicle–The conveyance (trailer) vehicle (Figure 6-6) is a semi trailer that can be attached to a standard tractor. The trailer provides the necessary supports and attachment points for securing the cask in the vertical orientation during transport to the 105 KW Basin for unloading and then back to the 105 KE for loading.

- The STC Lifting System–The STC lifting system is used to lift the STC out of the dummy elevator pit, transfer it by rail to the Cask Transfer Annex and into the CTO.

- The Cask Transfer Annex crane will transfer the STC/CTO to the transfer tractor trailer.

- Cask Transfer Annex–The loaded STC will be placed into the CTO inside the Cask Transfer Annex, see Figure 6-1. The Cask Transfer Annex employs a series of doors to maintain contamination control during the operation involving the handling of the STC. When an empty STC/CTO is returned to the 105 KE Basin for loading, the process is reversed.

6.3 BASIN WATER TREATMENT SYSTEM

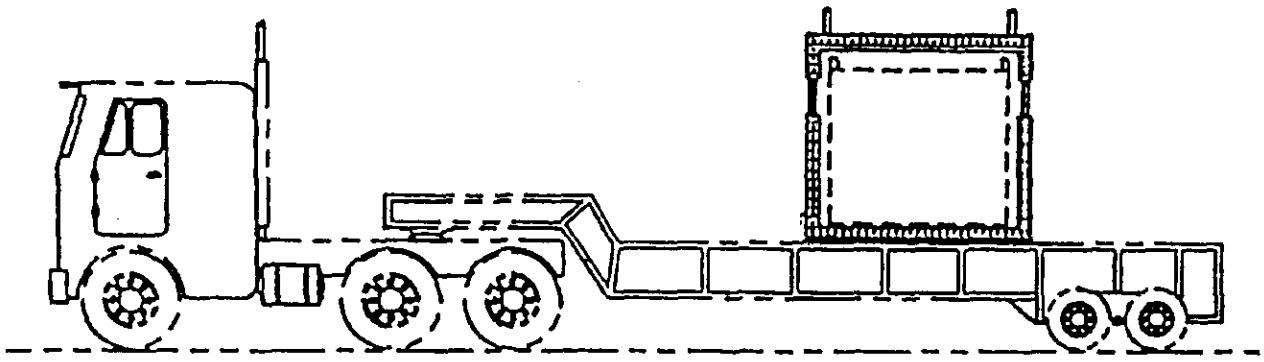
The following existing basin water treatment systems maintain basin water quality:

1. **Skimmer System**–The existing skimmer loop system is located on the north side of the basin and uses a backwashable sandfilter for filtration and an IXM for final treatment. The sandfilter discharges water to the west bay of the basin after being filtered and a portion treated in the IXM. The sandfilter backwash will continue to go to the north loadout pit, an underwater sludge accumulation area.

2. **Recirculation System**–The existing recirculation system draws water from about eight feet deep in the basin, and cools it as needed in an air cooled chiller. It can then be run through cartridge filters and an IXM if needed, and is subsequently returned directly to the basin.

[1] NucFil is a registered trademark of Nuclear Filter Technology.

Figure 6-6. Conveyance Vehicle.



6.4 CASK TRANSFER ANNEX

As the STC leaves the 105 KE Basin facility, it will enter a new structure called the cask transfer annex (CTA). The 105 KE double doors to the exterior on the north side will be removed to allow the cask transfer rails upon which the cask rolls to enter and exit the basin to the CTA. The CTA will be attached to the 105 KE Basin by a flexible expansion joint. The CTA will be a rigid structure with hard siding. The CTA will be equipped with an exhauster that will maintain air flow patterns from the CTA to 105 KE Basin. An evaporative cooler may be used to recirculate the air in the CTA for comfort cooling. The CTA will have an area to store STC/CTOs if required. The exit from the enclosed portion of the CTA will be through two sets of double doors. See Figure 6-1. After leaving the enclosed portion of the CTA, the STC/CTO will be moved by the cask transfer crane to the transport truck area. This is a non-enclosed area.

6.5 WATER RETURNS TO THE 105 K EAST BASIN FROM COLD VACUUM DRYING

During processing at the Cold Vacuum Drying Facility (CVDF), most of the water and some of the particulates will be removed from Multi-Canister Overpack s (MCOs). It might become necessary to return the water removed to the 105 KE Basin. If the excess water is returned, the water would be treated first by ion exchange and filtration to reduce the radionuclides.

The liquid at the CVDF may be transferred to the 105 KE Basin by tanker trucks. A temporary building will be provided outside the transfer bay to house the truck unloading/loading area. This temporary area will house a spill containment pan for the tanker, piping, pump, and instrumentation. For unloading, the tanker truck will be connected to the pump using flexible hose and quick disconnect fittings. Any leakage from the fittings will be cleaned up promptly to minimize smearable radioactive contamination.

The pump discharge will be hard-piped into the existing basin water treatment system or drained directly into the basin. An average of approximately 60,000 gallons of water per year could be transported from the CVDF.

6.6 EXCESS WATER REMOVED FROM THE BASIN

In the transfer bay area, there will be the capability to remove basin water through the existing basin water treatment system. Water will be removed via a connection located in the transfer bay. This water will be pumped to a tanker truck and transported to the 200 Area Effluent Treatment Facility (200 Area ETF). The tanker truck will be equivalent to the truck currently being used to transport water from the 100 N Emergency Dump Basin to the 200 Area ETF. The tanker truck will be located either in a transfer bay or in an enclosure adjacent to the facility.

6.7 DEBRIS REMOVAL DESCRIPTION

Debris is defined as anything (e.g., scrap, equipment, and material) that is over 0.25 inch in largest dimension that is not a permanent structure within the basin, is not used for current or planned operations or maintenance activity, and is not fuel or sludge. Debris would include such things as empty fuel canisters, old equipment (e.g., pumps, neutron detectors, other segregation equipment, etc.), hand tools, and miscellaneous irradiated and non-irradiated scrap. Debris will be removed and packaged for disposal in accordance with onsite methods.

The basin debris consists of widely varying forms of material ranging from those items easily cleaned and expected to have low levels of contamination to items that would be difficult to clean and be expected to have higher levels of contamination.

The canisters currently in the 105 KE Basin loaded with SNF will be transferred to the 105 KW Basin along with the SNF. Removal of the empty canisters from the 105 KW Basin is addressed in the 105 KW Fuel Removal NOC. Any empty canisters that are left in the basin will be cleaned under water using mechanical brushing and/or a pressure washer.

Other items that are amenable to cleaning, i.e., smooth, non-porous surfaces, will be cleaned by pressure washing or mechanical brushing to remove surface contamination. Upon removal from the water, these items will be rinsed with relatively clean water (demineralized water or IXM outlet water) and then will be promptly bagged or otherwise contained, or coated with a fixative or be removed into a greenhouse. Oversized debris, such as handling equipment and pipes, first could be cut to an appropriate size by using a hydraulic cutter under water or could be cut on removal from the water after applying protective bagging and tape.

Debris that cannot be readily cleaned (e.g., a fire hose) or that remains highly contaminated after cleaning will not be removed directly from the water, but will be removed into an engineered containment as practical.

Containment will be used on all such debris removal except when justified by ALARA review to be ineffective, impractical, or otherwise not justified. In no case will containment be removed if annual emissions would exceed those projected in Section 10.5. Containment forms range from a rigid structure that is ventilated (e.g., greenhouse) or a glovebox or glovebag that might or might not be ventilated. If ventilated, a HEPA type filtered exhaust will be used.

Some debris with high radiation dose rates could be placed into shielded containers underwater, the container removed from the water, rinsed, decontaminated, and properly dispositioned. Irradiated fuel element hardware would be expected to fall in this category.

Specific debris removal equipment and operation will be as follows. The monorail, hoist, and trolley will be used for transferring debris under water in the basin. Long-handled tools used to manipulate items under water will be used as required.

Cutters may be used to size the debris as required. The cutters will either be supplied form a portable hydraulic power pack or be manually operated cutters. Control for the operation of the powered cutter will be provided via a hydraulic valve assembly (closed loop) that controls

the cutter in both the forward (cutting) and reverse (release) direction. The motive fluid used in the cutter assembly will be an approved compatible water soluble hydraulic fluid.

When the debris has been properly prepared (bagged, painted, wrapped, etc.), the debris will be moved to a disposal container located near access doors in the transfer bay of the 105 KE Basin. Debris will be packaged in accordance with onsite methods.

6.8 SLUDGE MOVEMENT AND SAMPLING

The existing equipment used for manual sludge movement is a system similar to a swimming pool cleaner, which consists of a hand-held wand and vacuum pump discharge hoses that go directly to the sludge accumulation areas under water (DOE/RL 1995). This process will handle sludge cleanup while the FRS is being installed and operated, using the current water treatment system. Sludge accumulated from the sandfilter backwashes is discharged to the north loadout pit for settling. Sludge generated by other activities involving fuel movement is accumulated in the weasel pit.

It might be necessary to collect and transfer sludge samples from the floor and pit areas. Selected samples will be taken using specially designed portable equipment similar to that previously used for sludge sampling in 105 KE Basin. This equipment will use a peristaltic pump that fills a sample container with a liquid slurry of basin water and floor sludge. Because the design incorporates check valves used within the sample lines, the sample is never directly exposed to the air.

6.9 FACILITY MODIFICATIONS

The following information describes the methods that will be used to make those modifications to the facility for those systems and processes described in the preceeding sections.

6.9.1 General Construction Activities

General construction activities identified thus far include the following. Any additional activities necessary will be conducted within the bounds of project air emissions identified in Section 11.0, Table 11-2. All activities will be performed using standard personnel protective equipment, ALARA practices, and use specific controls discussed in Section 8.0.

- Above Water Work
  - Drilling including but not limited to steel, wood, asbestos, concrete
  - Asbestos removal and replacement
  - Grinding, cutting, and abrading of metals
  - Carpentry activities

- Welding activities
- Electrical wiring installation, reconfiguration, and rerouting
- Pipe, hose and valve installation; reconfiguration, and rerouting
- Instrument installation, reconfiguration, and rerouting
- Heating and cooling equipment installation, reconfiguration, and rerouting that does not impact airflow in or out of the building
- Paint and coating removal and application
- Structural steel removal, replacement, reconfiguration, and upgrade
- Cement, mortar, grouting and concrete removal, replacement, reconfiguration, and installation
- Lifting, hoisting, lowering, dragging, pulling, and pushing of construction supplies and equipment
- Use of gas engines and electric motors
- Use of hydraulic, pneumatic, and electric hand-tools and equipment
- Pump (for transport of water, compressed air or grouting) installation, use, reconfiguration, and removal
- Manually operated equipment installation, reconfiguration, and removal
- Nondestructive testing
- Use of portable heaters for personnel comfort
- Obsolete and unused equipment disconnection and removal
- Debris removal, using controls discussed in Section 8.0 of the NOC.

• Below Water Work

- Drilling including, but not limited to, concrete
- Grinding, cutting, and abrading of metals
- Pipe and hose installation, reconfiguration, and rerouting
- Cement, mortar, grouting and concrete removal, replacement, reconfiguration, and installation

- Obsolete and unused equipment disconnection and removal
- Manually operated equipment installation, reconfiguration, and removal
- Remotely operated equipment installation, reconfiguration, and removal
- Nondestructive testing
- Debris relocation, using controls discussed in Section 8.0 of this NOC
- Pump (for transport of water, compressed air, sludge, and grouting) installation, use, reconfiguration, and removal
- Fuel relocation. (Throughout the lifetime of the facility, small quantities of fuel canisters have been moved during previous activities. Approximately 30 percent of the fuel canisters might require relocation to support FTS equipment installation. Fuel canisters might be moved more than once, i.e. out of the way for equipment installation and later along with other fuel as the canisters enter the FTS. Current methods will be used.

6.9.2 Fuel Retrieval System

The following information describes the activities that will occur during the construction of the FTS equipment previously described in Section 6.1. Any additional activities necessary will be conducted within the bounds of projected air emissions identified in Section 11.0, Table 11-2. All activities will be performed using standard personnel protective equipment and ALARA practices.

- Above Water Work--Installation/Reconfiguration of:
  - Basin building structural steel and overhead trolley rail upgrades
  - Radiation shielding where necessary
  - New canister handling hoists
  - Basin grating
  - Electrical and mechanical utility services.

6.9.3 Shielded Cask Loadout System

The following information describes the activities that will occur during the construction of the shielded cask loadout system previously described in Section 6.2. Any additional activities necessary will be conducted within the bounds of projected air emissions identified in Section 11, Table 11-2. All activities will be performed using standard personnel protective equipment and ALARA practices.

- Above Water Work
  - Reroute miscellaneous conduit
  - Install personnel heaters
  - Install windbreak and upgrade rollup door components
  - Upgrade compressed air system
  - Relocate/install radiation detector
  - Install rinse and decontamination water piping
  - Install electrical and mechanical utilities
  - Decontaminate and seal conveyance vehicle driving surfaces
  - Decontaminate and seal cask receiving area
  - Prepare laydown and decontamination area(s)
  - Install new overhead cranes and cask lifting devices
  - Erect Cask Transfer Annex including foundation construction. Appendix C to this NOC contains an ALARACT demonstration for the foundation construction of an annex to be used for a integrated water treatment system which will now be used as a cask transfer annex
  - Route demineralized water or IXM outlet water piping to the dummy elevator pit.
- Below Water Work
  - Remove general debris from dummy elevator pit
  - Install cask loading system in dummy elevator loadout pit (to include sludge/sediment relocation and floor surface preparation including grouting to level floor as necessary).

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7.0 ANNUAL POSSESSION QUANTITY AND PHYSICAL FORM (REQUIREMENTS 8, 10, 11, AND 12)

It is noted that the following discussion is presented to provide the reader with an understanding of the approximate quantity of radioactive material to be handled during the course of the proposed activities. However, the inventory identified is not used to directly calculate the projected emissions in Sections 10.0 and 11.0.

The 105 KE Basin contains approximately 1,150 metric tons of uranium N Reactor fuel (approximately 3,700 canisters) and five containers filled with 138 aluminum-clad fuel elements (0.4 metric tons of uranium) from the SPR. The N Reactor fuel consists of slightly enriched metallic uranium completely enclosed and bonded to a layer of zirconium alloy (Zircaloy-2), also known as the cladding. Two elements are combined together to form a fuel assembly (refer to Chapter 6.0, Figure 6-7). The SPR fuel is very similar, except the fuel is of smaller dimensions and is clad in aluminum. The cladding is designed to provide a barrier against the escape of the radionuclide source term (fission products and fissile materials).

During the cleanout of the F and H Reactor fuel storage basins, separate from this NOC, SNF may be found. The quantity of the SNF is estimated to not exceed 150 pounds. Appendix B to this NOC contains an ALARACT demonstration for the receipt and storage of F & H Reactor SNF at the K Basins.

The N Reactor fuel was discharged between 1975 and 1987. The fuel has decayed sufficiently to essentially eliminate iodine-131, as well as other short half-life radionuclides. Following discharge of the fuel from the N Reactor, the fuel was allowed to cool for a minimum of 150 days in N Basin. The fuel was placed into open-top canisters, loaded into railcars, and transported to the 105 KE Basin for storage.

The fuel cladding integrity varies from undamaged cladding that retains the radionuclide source term, to fuel that has breached its cladding from reactor defueling and subsequent handling operations. The cladding breaches range from cracking to the complete separation of fuel elements into two or more parts. Once the cladding has been breached, and the basin water gains access to the radionuclide source term, the radionuclides in the fuel either dissolve or corrode slowly over time. For example, radionuclides with high solubilities such as cesium and strontium dissolve into the basin water while less soluble radionuclides are oxidized (corroded), released from the fuel elements, and incorporated into the sludge or suspended in the water.

7.1 SOURCE TERM DESCRIPTION

The following sections provide a discussion on fuel elements, basin water, sludge, surface contamination, and the annual possession quantity.

7.1.1 Fuel Elements

The radionuclide inventory of the irradiated fuel is shown in Table 7-1, decayed to December 31, 1997. The irradiated fuel is the total source term in 105 KE Basin. The source term for all the potentially significant constituents is presented in Table 7-1 (constituents with an activity of less than one curie each were not included, but are available in the source document [WHC 1995a]). The quantity presented in Table 7-1 represents the total available inventory of the basin, whether still in the fuel, in the water, or in the sludge.

7.1.2 Basin Water

The water in the 105 KE Basin provides both cooling and shielding. The sludge and fuel are immersed in 1.3×10^6 gallons of water. Even with the large size of the source term in the fuel and sludge, the source term in the basin water is relatively small.

Table 7-2 represents data from a routine analysis for selected basin radionuclides taken on February 20, 1996. Predominant isotopes present in the water were tritium (15 curies), strontium-90 (10 curies), and cesium-137 (17 curies). Except for tritium, varying levels are achieved depending on the operation of the water treatment systems. These data are presented for information as to the relative quantities present in the water.

The radionuclides of significance in the airborne emissions are known to be particulates that originate from the basin water. The primary mechanisms responsible for airborne contamination are transport of particulates at the water line of the basin, and suspension of surface contamination on basin floors, gratings, tools, and debris/equipment removed from the basin water (WHC 1993b).

7.1.3 Sludge

The radionuclide inventory (source term) of sludge in the 105 KE Basin is given in Table 7-3. This inventory data was taken from HNF-SD-SNF-TI-009, Rev. 4. In order to account for uncertainties in these estimates, the inventory data values were multiplied by a factor of 4 to provide a bounding value.

7.1.4 Surface Contamination

Most of the interior of the 105 KE Basin has measurable surface (removable) contamination. Weekly surveys are performed to measure the levels and assess changes in these levels. An administrative control level of 10,000 d/m/100 cm^2 of β-γ and 500 d/m/100 cm^2 α is employed, above which the contamination levels are required to be reduced by decontamination to the extent practical. Radiological control requirements dictate that any areas above 100,000 d/m/100 cm^2 of β-γ and 2000 d/m/100 cm^2 α are posted 'DANGER, HIGH CONTAMINATION AREA." There is only one small (10 square feet) area of the basin piping underneath lead shielding that is permanently posted as discussed. This is not accessed routinely and will not be disturbed in the performance of the activities described in this NOC.

Table 7-1. 105 KE Basin Radionuclide Inventory (Source Term).

Radionuclide	Inventory (Ci)		Radionuclide	Inventory (Ci)
^{3}H	1.84 E+04		^{137}Cs	6.61 E+06
^{14}C	3.62 E+02		$^{137}Ba^{m}$	6.255 E +06
^{55}Fe	1.08 E+03		^{144}Ce	1.09 E+03
^{60}Co	1.96 E+03		^{144}Pr	1.08 E+03
^{59}Ni	2.11 E+01		$^{144}Pr^{m}$	1.31 E+01
^{63}Ni	2.31 E+03		^{147}Pm	2.73 E+05
^{79}Se	4.35 E+01		^{151}Sm	8.95 E+04
^{85}Kr	2.92 E+05		^{152}Eu	4.77 E+02
^{90}Sr	5.01 E+06		^{154}Eu	5.48 E+04
^{90}Y	5.01 E+06		^{155}Eu	1.19 E+04
^{93}Zr	2.01 E+02		^{234}U	4.66 E+02
$^{93}Nb^{m}$	1.24 E+02		^{235}U	1.77 E+01
^{99}Tc	1.45 E+03		^{236}U	6.61 E+01
^{106}Ru	1.84 E+03		^{238}U	3.80 E+02
^{106}Rh	1.84 E+03		^{237}Np	3.02 E+01
^{107}Pd	8.59 E+00		^{238}Pu	6.07 E+04
$^{113}Cd^{m}$	1.84 E+03		^{239}Pu	1.15 E+05
$^{121}Sn^{m}$	4.03 E+01		^{240}Pu	6.38 E+04
^{126}Sn	8.07 E+01		^{241}Pu	2.60 E+06
^{125}Sb	1.88 E+04		^{242}Pu	3.07 E+01
^{126}Sb	1.13 E+01		^{241}Am	2.03 E+05
$^{126}Sb^{m}$	8.07 E+01		^{242}Am	1.14 E+02
$^{125}Te^{m}$	4.57 E+03		$^{242}Am^{m}$	1.14 E+02
^{129}I	3.26 E+00		^{243}Am	7.12 E+01
^{134}Cs	7.99 E+03		^{242}Cm	0.2 E+01
^{135}Cs	3.96 E+01		^{244}Cm	8.84 E+02
				2.67 E+07

Source: WHC 1995a (only those isotopes with an activity greater than 1.0 curie reported).

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Table 7-2. Radionuclides in 105 KE Basin Water (February 20, 1996).

Isotope	Concentration (microcuries per milliliter)	Activity (curies)
^{241}Am	6.50 E-06	0.03
^{134}Cs	2.05 E-06	0.01
^{137}Cs	3.45 E-03	16.91
^{60}Co	1.06 E-06	0.01
^{152}Eu	3.44 E-06	0.02
Eu^{154}	2.99 E-06	0.01
^{155}Eu	6.62 E-06	0.03
^{238}Pu	1.71 E-05	0.08
$^{239/240}Pu$	2.94 E-05	0.14
^{90}Sr	2.06 E-03	10.09
^{3}H	3.06 E-03	14.99
Total		42.33

Note: Volume of basin assumed to be 4.9 E+09 milliliters, (1.29 E+06 gallons).

2

Table 7-3. Estimated 105 KE Basin Sludge Annual Possession Quantity. (2 sheets)

Radionuclides	Nominal Inventory KE Basin (Ci)**	Bounding Data (4 times nominal)** (Ci)
H-3*	3.63 E+01	1.45 E+02
CO-60	4.50 E+01	1.80 E+02
Kr-85*	5.77 E+02	2.31 E+03
Sr-89/90	2.23 E+04	8.92 E+04
Tc-99	5.27 E+01	2.11 E+02
Sb-125	0.00 E+00	0.00 E+00
Cs-134	1.25 E+01	5.00 E+01
Cs-137	2.35 E+04	9.40 E+04
Eu-152	4.29 E+00	1.72 E+01
Eu-154	1.84 E+02	7.36 E+02
Eu-155	7.21 E+01	2.88 E+02
U-233	0.00 E+00	0.00 E+00

Table 7-3. Estimated 105 KE Basin Sludge Annual Possession Quantity. (2 sheets)

Radionuclides	Nominal Inventory KE Basin (Ci)**	Bounding Data (4 times nominal)** (Ci)
U-234	3.81 E+01	1.52 E+02
U-235	1.34 E-01	5.37 E-01
U-236	4.38 E-01	1.75 E+00
Np-237	1.90 E-01	7.60 E-01
U-238	2.28 E+00	9.10 E+00
Pu-238	2.47 E+02	9.88 E+02
Pu-239/240	1.29 E+03	5.16 E+03
Pu-241	2.31 E+04	9.24 E+04
Am-241	1.21 E+03	4.84 E+03
Total	7.27 E+04	2.91 E+05

*Tritium and Krypton-85 are taken from fuel/sludge inventories from K East and K West (Table 7-1 of DOE/RL-96-101 and Table 7-1 of DOE/RL-97-28, respectively), multiplied by the "sludge:fuel ratio" of 1.07E+5:5.47E+7 to obtain values for the sludge inventory.

**Inventory data for radionuclides are taken fro HNF-SD-SNF-TI-009, Rev. 4, Table 2-1 and Table 2-2, using the nominal values. These values were multiplied by a factor of 4 to provide bounding data for safety and design considerations.

Therefore, most above water activities described in this NOC are expected to be conducted with contamination levels less than the administrative control levels, or less than 10,000 d/m/100 cm^2 of β-γ and 500 d/m/100 cm^2 α.

7.2 ANNUAL POSSESSION QUANTITY, PHYSICAL FORM, RELEASE FORM, AND CHEMICAL FORM

The annual possession quantity is identified in Table 7-1 as all the radionuclides originate with the SNF. Table 7-4 represents data on some of the more significant isotopes and their release forms. Tritium and krypton are released routinely during basin operation because of ongoing fuel corrosion, while the balance of the isotopes are released are particulate solids. As the fuel corrodes, complex compounds are produced that are not easily categorized.

Physical form, release form, chemical form, and radionuclides that could contribute greater than 10 percent of the potential to emit total effective dose equivalent to the maximally exposed individual are identified in Table 7-4. Cesium-137 is also included as it is used as an indicator isotope.

Table 7-4. Physical Form, Release Form, and Chemical Form.

Radionuclide	Physical Form	Release Form	Chemical Form*
^{90}Sr	solid	particulate solid	various
^{137}Cs	solid	particulate solid	various
$^{239/240}Pu$	solid	particulate solid	various
^{241}Am	solid	particulate solid	various

*Radionuclides identified as various form numerous complex compounds.

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8.0 CONTROL SYSTEM (REQUIREMENT 6)

The 105 KE Basin does not provide for inlet supply air and exhausted air is not filtered. Air is exhausted from the building via roof vents, two over the basin and two over the high bay transfer area.

All radioactive particulates providing the potential for airborne emissions from the 105 KE Basin will or have originate(d) from the basin water. The primary mechanisms responsible for airborne contamination are transport of particulates at the water line of the basin, and suspension of surface contamination on basin floors, grating, tools, and debris/equipment removed from the basin water (WHC 1993b).

8.1 CONTROLS FOR BELOW WATER ACTIVITIES

The controls which will be used as the abatement technology for underwater activities have the objective of maintaining basin water quality within established levels by removing particulate matter from the basin water, remove dissolved radionuclides from the water, and cooling the water.

8.1.1 Basin Water

The basin water consists of the 1.3×10^6 gallons of water that cover the irradiated fuel. The basin water is an inherent part of the fuel storage process. The water precludes the radionuclide source term from becoming directly airborne as might occur if the water were absent. The water also provides radiation shielding. Fuel handling operations involving direct contact with the fuel will be conducted under water.

8.1.2 Existing Water Treatment

The existing basin water treatment system is listed below and are described in Section 6. Their removal efficiencies are described in Table 8-1.

System/Component	Purpose
Primary Recirculation System Chiller	Cool basin water which reduces the solubility of the radionuclides and reduces corrosion of the SNF.
Cartridge Filter	Remove particulate radionuclides.
Skimmer System Sandfilter	Remove particulate radionuclides.
IXM	Remove dissolved radionuclides.

Table 8-1. Projected Removal Efficiencies of the Existing 105 KE Basin Water Treatment System.

Equipment	Nominal Flow Rate	Efficiency at Stated Particulate Size	Remarks
Sandfilter (existing)	400 gpm	95%	Particulate removed at 10 microns or larger
IXMs	160 gpm	N/A[1]	No particulate removal anticipated
Cartridge Filter (existing on recirculation system)	450 gpm	95%	Disposal cartridge filters for particles 5 microns or larger in size (varying filter sizes are available)

Note:
[1] Radionuclide removal efficiency of key dissolved isotopes is as follows:
Strontium 99%
Cesium 99%
Plutonium 81%

The cartridge filters are not normally used because of the occupational radiological exposure during changeout.

8.2 CONTROLS FOR ABOVE WATER ACTIVITIES

Specific controls will be applied to the FTS, as necessary, for individual above water activities. However, the construction activities described will involve, to the most degree, uncontaminated new equipment. Where existing above water contaminated equipment or structures are involved that will be disturbed, ALARA practices will be followed to minimize emissions. Contaminated areas will be decontaminated before work, as practical, or engineered controls such as glovebags, fixatives, ventilation or containment will be applied when practical to do so.

Maintenance activities performed on fuel removal equipment will follow current ALARA practices. These activities will be conducted in accordance with routine activity contamination control practices, e.g., glovebags, decontaminations, fixatives, etc., thus minimizing the potential to emit. Any items that need to be removed from the water will be rinsed upon removal from the water; if these items need to be left out of the water, the items will be bagged in plastic for storage. Maintenance on components that directly contact the fuel, will be conducted within a confinement enclosure such as glovebag or HEPA ventilated enclosure.

The ALARA practices are part of the past DOH approval conditions (AIR 98-105, Condition No. 2, 105KW) which are also applicable to the 105 KE Basin. Information pertaining to these ALARA practices was provided to DOH at an October 27, 1999 meeting (SNF 2001).

The STC will have one or more metal high integrity filters for venting. The filter is designed to provide 99.7 percent removal efficiency of 0.3 micron (μm) particles. This filter will be located in the STC lid.

The CTO will have one or more Nuc-Fill® filters for venting. These filters will be located in the CTO lid.

8.3 CONTROL EQUIPMENT EFFICIENCIES

The water treatment system contains ion exchange components for removal of dissolved radionuclides and particulate filters for removal of particulate radionuclides. Projected removal efficiencies are presented in Table 8-1. The removal efficiencies will be variable over time for each of the water treatment system components due to the loading on the individual component. The IXMs are changed out when sampling indicates the removal efficiency for cesium-137 decreases from 99 percent to approximately 90 percent. Administrative limits for the IXM efficiencies as listed above also take into consideration the need to not have the IXM become TRU waste.

8.4 CONFIGURATION OF WATER TREATMENT SYSTEMS

This section describes the water treatment systems to be operational for storage/movement of SNF, sludge and debris. Table 8-2 provides the normal and backup water treatment system operational controls.

Table 8-2. Normal and Backup Water Treatment System Operational Controls.

Underwater Activity[2]	Existing Basin Water Treatment System[1]			
	Skimmer System		Primary Recirculation System	
	Sandfilter	IXM	Chiller	Cartridge Filter
Storage of SNF in Canisters	N	N	B	B
Relocating sludge within basin pool	N	N	B	B
Relocating/removal of SNF, debris from basin pool	N	N	B	B

[1]During times when the skimmer system/primary recirculation system are shut down for maintenance, IXM changeout, etc., underwater work that does not disturb the sludge or fuel source (e.g., changing underwater lights, movement of underwater video cameras) may be performed.

[2]No operations that disturb the source term in the water will be conducted if Cesium-137 concentration in the basin water exceeds 30 micro curies per liter. Additional, at a level of 15 microcuries per liter of cesium-137, incremental water treatment equipment will be placed on line.

N = Normal Operation B = Backup Operation

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9.0 MONITORING SYSTEM (REQUIREMENT 9)

The 105 KE Basin does not provide inlet supply air and exhausted air is not filtered. Air is exhausted from the building via roof vents, two over the basin and two over the transfer high bay area. The maximum combined air flow from the four roof vents is approximately 55,000 cubic feet per minute (WHC 1993c).

The sampling system inside the 105 KE Basin consists of three fixed head samplers. The design of the fixed head samplers allows the filter head to be lowered or elevated for safe changeout and sample collection. The particulate filters from the three samplers are collected weekly. The particulate filters are currently delivered to Hanford Waste Sampling and Characterization Facility (WSCF). The WSCF performs total alpha/beta and isotopic analyses on the particulate filters. The contractual detection limits and other requirements are specified in the Statement of Work for services provided by the Waste Sampling and Characterization Facility Effluent and Environmental Monitoring Program, HNF-EP-0835. Weekly filters are composited for a monthly gamma scan, strontium-90, americium-241, and plutonium isotopic analysis. The particulate radionuclides contributing 10 percent or more of the potential-to-emit from 105 KE Basin are plutonium-239/240, plutonium-241, and americium-241.

The three samplers are located as follows: two are located over the 105 KE Basin and one is located in the transfer high bay area. The samplers over the 105 KE Basin are positioned directly in front of roof vent 11 and roof vent 10, the inlet to the exhaust fans. The sample head filter assembly is attached to an adjustable support extended to the inlet of the fan, about 11.1 feet above the floor. The third sampler is in the transfer high bay area near exhaust fans roof vent 6 and roof vent 7. The filter assembly for the high bay sampler is approximately 20 feet above the floor. Figure 9-1 identifies the relative position of these fixed head samplers.

The sampler system design eliminates any sample line loss concerns. The particulate filter employed is a 1.85-inch-glass fiber filter with a 91 percent capture efficiency for particles with a median diameter of 0.3 micron. The sampler filter assembly is connected to a vacuum pump via plastic tubing. Because the particulate filter is upstream of the plastic tubing, the particulate filter is not influenced by the tubing. The sample pumps are equipped with a flow regulator. The nominal sample flow rate is a 2.12 cubic feet per minute.

Operational checks of the exhaust fans and the sample pumps are performed daily. In the event a fan is found not operating or is de-energized for any reason, the sampler is turned off until the exhaust fan is returned to service. The operability information for the samplers and exhaust fans is logged and reported to monitoring program personnel. The sample pump flow rate is checked quarterly using a calibrated National Institute of Standards and Technology traceable flow meter.

In addition to the system described previously, near-field ambient air monitoring currently is being performed at several locations around the 105 KE Basin. Three monitors, designated as N-402, -403, and -404 will continue to be operated until all activities and operations described in this NOC are complete.

Figure 9-1. Fixed Head Sampler Positions.

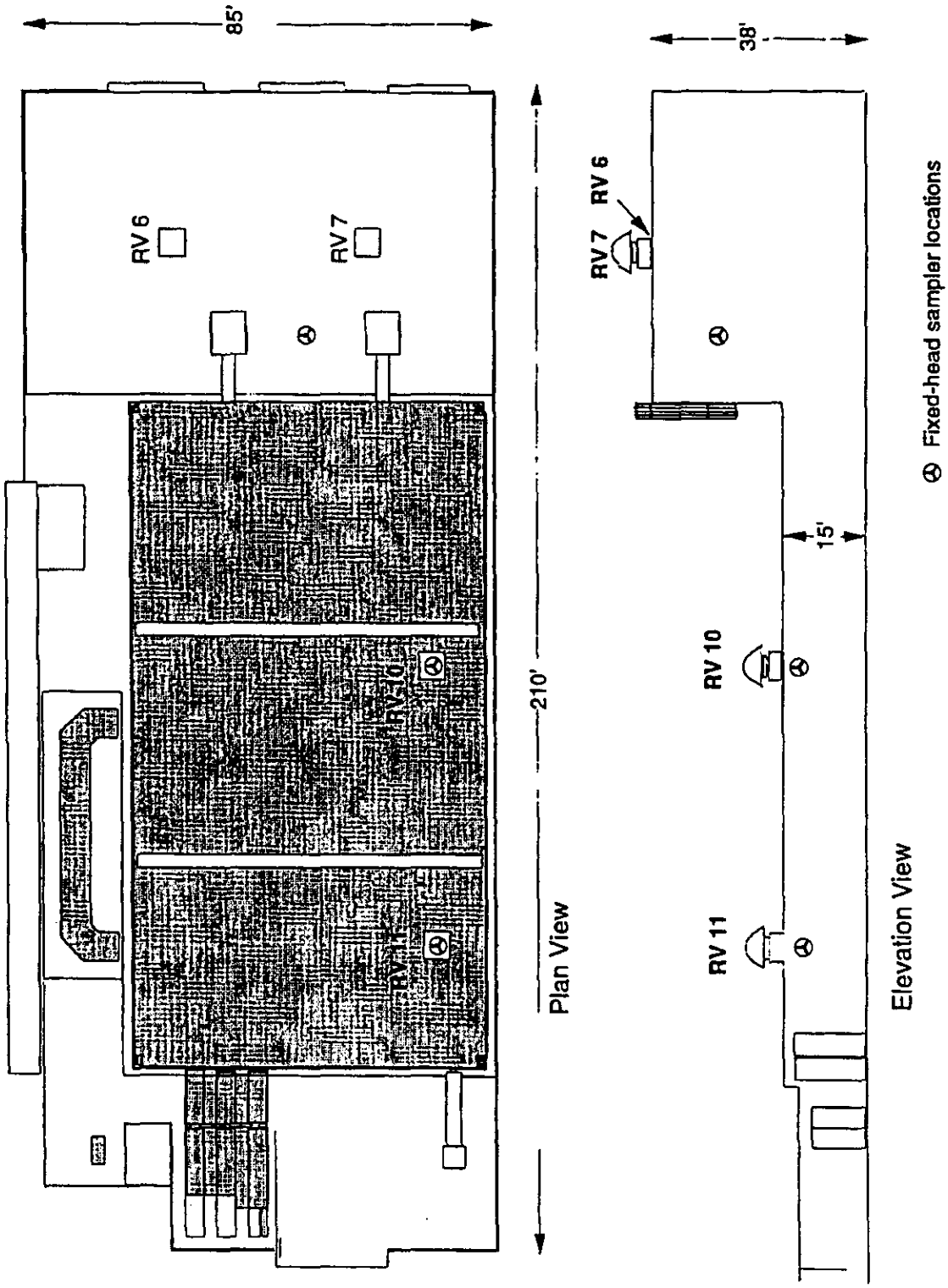
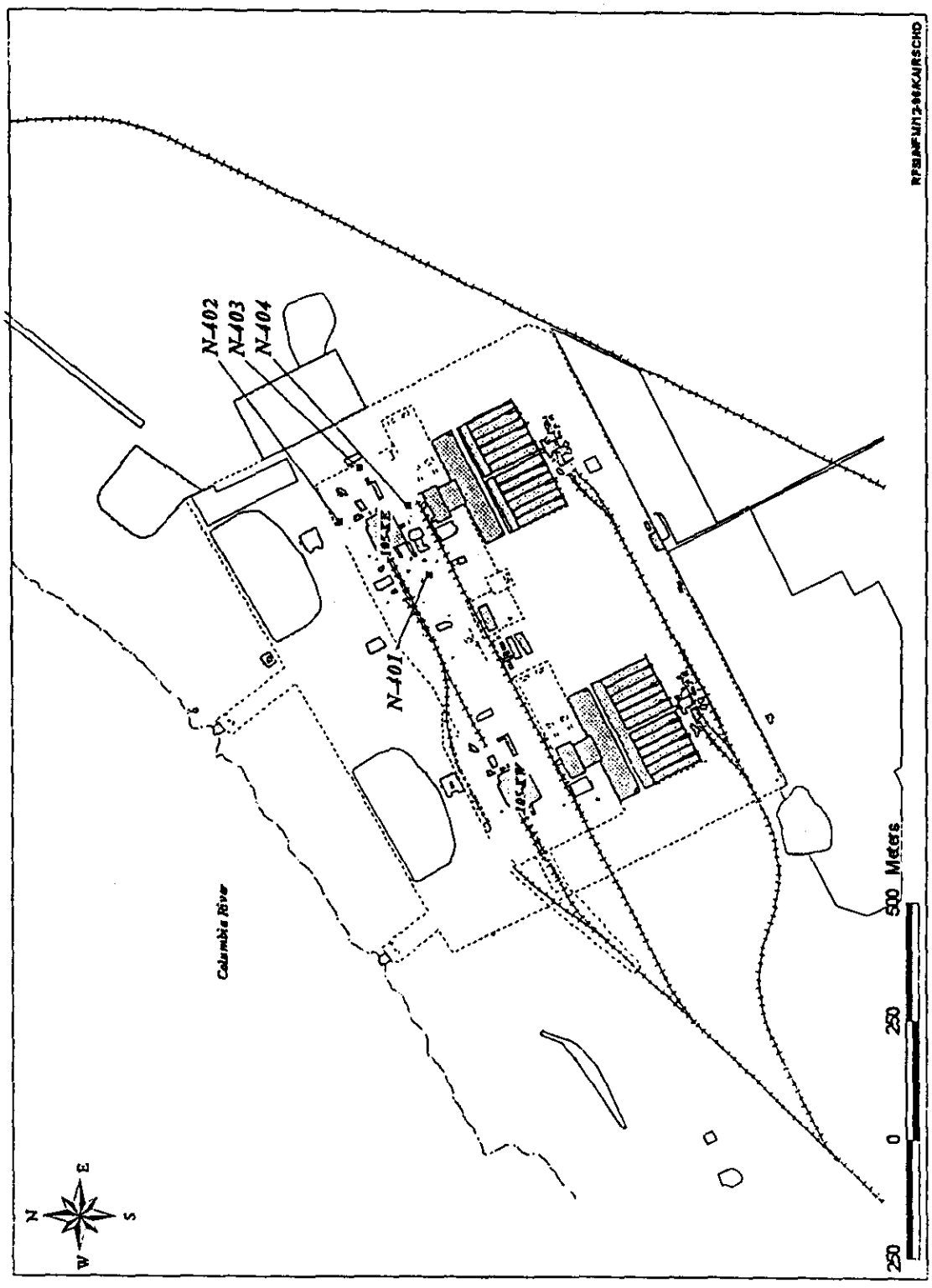


Figure 9-2. Locations of Near-Field Monitoring Locations.



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10.0 RELEASE RATES (REQUIREMENT 13)

The following provides an estimate of the abated and unabated emissions.

As described in Sections 6, 8, and Appendix A, BARCT for those activities covered under this NOC is control of the water quality within the 105KE Basin pool. To that effect, the unabated and abated emissions from the 105KE Basin are defined as follows:

Unabated Emissions: Those emissions which would occur without effective use of abatement controls.

Abated Emissions: Those emissions that would occur with optimum use of abatement controls.

Abatement controls involve the use of water filtration, ion exchange, and cooling. Basin water quality is a function of the challenge to these systems, i.e., underwater operations in the basin disturbing the fuel and sludge, and the operating status and configuration of these processes. The abated emissions from the facility are based on a basin water quality of 3 μCi/l of Cs-137 which existed in general for all of 1995 during which time there was effective use of these systems. The unabated emissions from the facility are based on a basin water quality of 30 μCi/l of Cs-137. This is considered a worse case as the Cs-137 concentrations in the basin reached upwards to 23 μCi/l during the fuel segregation campaign from 1983 to 1984 where the entire fuel inventory was repackaged with water treatment capability less than that which exists today.

10.1 DERIVATION OF FACILITY SPECIFIC RELEASE FACTOR

The total radiological inventory in the 105KE Basin, whether in the fuel, sludge, or water, is given in Table 7-1. This represents the annual possession quality. Table 10-1 describes the radiological emissions from the 105KE Basin from 1995 to 1999 for those radionuclides that contribute greater than 10% of the unabated does to the MEI or greater than 25% of the abated does to the MEI. Also included is CS-137 since it is used as an indicator isotope.

Table 10-1. Radioactive Air Emissions Measured in Curies At the 105KE Basin in Calendar Years 1995 to 1999.

Isotope	Calendar Year Releases (Ci)				
	1995	1996	1997	1998	1999
Sr-90	5.9 E-06	1.7 E-05	1.6 E-05	1.4 E-05	1.9 E-05
Cs-137	2.4 E-04	4.2 E-05	4.8 E-05	2.6 E-05	4.3 E-05
Pu-239/240	1.5 E-05	3.1 E-06	3.6 E-06	3.1 E-06	4.1 E-06
Am-241	5.6 E-06	1.8 E-06	2.3 E-06	1.9 E-06	2.3 E-06

Radioactive airborne emissions from the 105KE Basin are derived from the spent nuclear fuel and sludge stored underwater. Therefore, there is one release fraction from the radiological source term itself (fuel and sludge) to the basin water mass and another release fraction from the basin water mass to the basin airspace. This transport mechanism is discussed in detail in WHC 1993b.

The release fraction of the radiological source term (fuel and sludge) to the basin water is derived as follows using data from 1995:

Water Cs-137 source term:

CS-137 concentration in basin water x water volume

$$\frac{3\ \mu Ci}{l} \times \quad 1.3E{+}06gal \quad \times \frac{3.78l}{gal} = \quad 1.5E{+}01 \text{ curies}$$

Fuel and Sludge Cs-137 source term:

6.6E+06 curies (Table 7-1)

Therefore, the release fraction from the radiological source term to the basin water (RFSW) is:

$$RF_{SW} = \frac{1.5E{+}01 \text{ curies}}{6.6E{+}06 \text{ curies}} = 2.3E{-}06$$

The release fraction from the basin water to the basin emissions is derived as follows also using data from 1995:

Water Cs-137 source term:

1.5E+01 curies (per above)

Annual Cs-137 Emissions

2.4E-04 curies (Table 10-1)

Therefore, the release fraction from the basin water to the facility emissions (RFWA) is:

$$RF_{WA} = \frac{2.4E{-}04 \text{ curies}}{1.5E{+}01 \text{ curies}} = 1.6E{-}05$$

The release fraction from the radiological source term (fuel and sludge) to the basin air (RFSA) is therefore:

RFSW x RFWA = RFSA

2.3E-06 x 1.6E-05 = 3.7E-11

This release fraction is used with the annual possession quantity described in Table 7-1 to derive the abated and unabated emissions except for those radionuclides that exist in a gaseous state, i.e., tritium, Kr-85, and I-129.

A release fraction for those radionuclides which exist in a gaseous state was determined by calculating the curies of tritium released to the air based on measured basin water tritium concentration, a nominal evaporation rate, and then comparing that to the tritium source term as follows:

Concentration of tritium in basin water = 3.0E-03 μCi/ml

Evaporation rate of basin water = 41.6 l/hr

Therefore:

(3.0E-03 μCi/ml) (4.16E+04ml/hr) (8760 hr/yr) (1E-06Ci/μCi) = 1.1 Ci/yr of tritium

The release fraction for tritium is:

$$\frac{1.1 \text{ curies}}{1.84E+04 \text{ curies}} = 6.0E-05$$

10.2 ABATED EMISSIONS

The abated emissions in Table 10-2 were estimated using the annual possession quantity in Table 7-1 times the release fraction, RFSA, derived above, i.e., 3.7E-11, and a release fraction of 6.0E-05 for those radionuclides in a gaseous state, i.e., tritium, Kr-85, and I-129.

10.3 UNABATED EMISSIONS

The unabated emissions in Table 10-2 were estimated by increasing the release fraction, RFSA, derived above, i.e., 3.7E-11, by a factor of 10 which correlates to increasing the basin water concentration by a factor of 10, i.e., from 3 μCi/l to 30 μCi/l of Cs-137.

Table 10-2. KE Abated and Unabated Emissions. (2 sheets)

105 KE BASIN TABLE 7.1 SOURCE TERM		Release Fraction	Abated based on water at (3 uCi/LCs-137) Emission (Ci)	Adjusted Release Fraction	Unabated based on water at (30 uCi/LCs-137) Emission (Ci)
Radionuclide	**Inventory (Ci)**				
H-3	1.84E+04	6.00E-05	1.10E+00	1.00E+00	1.10E+00
C-14	3.62E+02	3.70E-11	1.34E-08	1.00E+01	1.34E-07
Fe-55	1.08E+03	3.70E-11	4.00E-08	1.00E+01	4.00E-07
Co-60	1.96E+03	3.70E-11	7.25E-08	1.00E+01	7.25E-07
Ni-59	2.11E+01	3.70E-11	7.81E-10	1.00E+01	7.81E-09
Ni-63	2.31E+03	3.70E-11	8.55E-08	1.00E+01	8.55E-07
Se-79	4.35E+01	3.70E-11	1.61E-09	1.00E+01	1.61E-08
Kr-85	2.92E+05	6.00E-05	1.75E+01	1.00E+00	1.75E+01
Sr-90	5.01E+06	3.70E-11	1.85E-04	1.00E+01	1.85E-03
Y-90	5.01E+06	3.70E-11	1.85E-04	1.00E+01	1.85E-03
Zr-93	2.01E+02	3.70E-11	7.44E-09	1.00E+01	7.44E-08
Nb(m)-93	1.24E+02	3.70E-11	4.59E-09	1.00E+01	4.59E-08
Tc-99	1.45E+03	3.70E-11	5.37E-08	1.00E+01	5.37E-07
Ru-106	1.84E+03	3.70E-11	6.81E-08	1.00E+01	6.81E-07
Rh-106	1.84E+03	3.70E-11	6.81E-08	1.00E+01	6.81E-07
Pd-107	8.59E+00	3.70E-11	3.18E-10	1.00E+01	3.18E-09
Cd(m)-113	1.84E+03	3.70E-11	6.81E-08	1.00E+01	6.81E-07
Sn(m)-121	4.03E+01	3.70E-11	1.49E-09	1.00E+01	1.49E-08
Sn-126	8.07E+01	3.70E-11	2.99E-09	1.00E+01	2.99E-08
Sb-125	1.88E+04	3.70E-11	6.96E-07	1.00E+01	6.96E-06
Sb-126	1.13E+01	3.70E-11	4.18E-10	1.00E+01	4.18E-09
Sb(m)-126	8.07E+01	3.70E-11	2.99E-09	1.00E+01	2.99E-08
Te(m)-125	4.57E+03	3.70E-11	1.69E-07	1.00E+01	1.69E-06
I-129	3.26E+00	6.00E-05	1.96E-04	1.00E+00	1.96E-04
Cs-134	7.99E+03	3.70E-11	2.96E-07	1.00E+01	2.96E-06
Cs-135	3.96E+01	3.70E-11	1.47E-09	1.00E+01	1.47E-08
Cs-137	6.61E+06	3.70E-11	2.45E-04	1.00E+01	2.45E-03
Ba(m)-137	6.26E+06	3.70E-11	2.31E-04	1.00E+01	2.31E-03
Ce-144	1.09E+03	3.70E-11	4.03E-08	1.00E+01	4.03E-07
Pr-144	1.08E+03	3.70E-11	4.00E-08	1.00E+01	4.00E-07
Pr(m)-144	1.31E+01	3.70E-11	4.85E-10	1.00E+01	4.85E-09
Pm-147	2.73E+05	3.70E-11	1.01E-05	1.00E+01	1.01E-04
Sm-151	8.95E+04	3.70E-11	3.31E-06	1.00E+01	3.31E-05

Table 10-2. KE Abated and Unabated Emissions. (2 sheets)

105 KE BASIN TABLE 7.1 SOURCE TERM		Release Fraction	Abated based on water at (3 uCi/LCs-137) Emission (Ci)	Adjusted Release Fraction	Unabated based on water at (30 uCi/LCs-137) Emission (Ci)
Radionuclide	Inventory (Ci)				
Eu-152	4.77E+02	3.70E-11	1.76E-08	1.00E+01	1.76E-07
Eu154	5.48E+04	3.70E-11	2.03E-06	1.00E+01	2.03E-05
Eu-155	1.19E+04	3.70E-11	4.40E-07	1.00E+01	4.40E-06
U-234	4.66E+02	3.70E-11	1.72E-08	1.00E+01	1.72E-07
U-235	1.77E+01	3.70E-11	6.55E-10	1.00E+01	6.55E-09
U-236	6.61E+01	3.70E-11	2.45E-09	1.00E+01	2.45E-08
U-238	3.80E+02	3.70E-11	1.41E-08	1.00E+01	1.41E-07
Np-237	3.02E+01	3.70E-11	1.12E-09	1.00E+01	1.12E-08
Pu-238	6.07E+04	3.70E-11	2.25E-06	1.00E+01	2.25E-05
Pu-239	1.15E+05	3.70E-11	4.26E-06	1.00E+01	4.26E-05
Pu-240	6.38E+04	3.70E-11	2.36E-06	1.00E+01	2.36E-05
Pu-241	2.60E+06	3.70E-11	9.62E-05	1.00E+01	9.62E-04
Pu-242	3.07E+01	3.70E-11	1.14E-09	1.00E+01	1.14E-08
Am-241	2.03E+05	3.70E-11	7.51E-06	1.00E+01	7.51E-05
Am-242	1.14E+02	3.70E-11	4.22E-09	1.00E+01	4.22E-08
Am(m)-242	1.14E+02	3.70E-11	4.22E-09	1.00E+01	4.22E-08
Am-243	7.12E+01	3.70E-11	2.63E-09	1.00E+01	2.63E-08
Cm-242	2.00E+00	3.70E-11	7.40E-11	1.00E+01	7.40E-10
Cm-244	8.84E+02	3.70E-11	3.27E-08	1.00E+01	3.27E-07
Total	2.67E+07		1.86E+01		1.86E+01

10.4 COMPARISON OF ABATED, UNABATED, AND ACTUAL EMISSIONS

A comparison of the abated, unabated, and actual 1995 to 1999 emissions is given in Table 10-3 for those radionuclides that contribute greater than 10% of the unabated dose to the MEI or greater than 25% of the abated dose to the MEI.

10.5 PROJECTED EMISSIONS DURING FUEL REMOVAL

The projected emissions from the 105KE fuel removal activities are expected to be within the estimated abated and unabated emissions as basin water quality will be within this range.

10.6 POTENTIAL TO EMIT ASSOCIATED WITH 100 AREA DIFFUSE/FUGITIVE EMISSION UNIT

The PTE associated with the 100 Area Diffuse/Fugitive Emission Unit is 1.86E+01 curies/year (Table 10-2).

Table 10-3. Comparison of Estimated Emissions with Actuals (Curies).

Isotope	Abated with water at 3uCi/l Cs-137	1995	1996	1997	1998	1999	Unabated with water at 30uCi/l Cs-137
Sr-90	1.9 E-04	5.9 E-06	1.7 E-05	1.6 E-05	1.4 E-05	1.9 E-05	1.9 E-03
Cs-137	2.5 E-04	2.4 E-04	4.2 E-05	4.8 E-05	2.6 E-05	4.3 E-05	2.5 E-03
Pu-239/240	6.6 E-06	1.5 E-05	3.1 E-06	3.6 E-06	3.1 E-06	4.1 E-06	6.6 E-05
Am-241	7.5 E-06	5.6 E-06	1.8 E-06	2.3 E-06	1.9 E-06	2.3 E-06	7.5 E-05

11.0 OFFSITE IMPACT (REQUIREMENT 14 AND 15)

An assessment was performed to determine if the maximum exposed individual (MEI) is an on-site or off-site receptor. This assessment concluded that the dose to an off-site receptor is greater than any on-site member of the public. The MEI is therefore located 8,900 meters NNW, and the unit dose conversion factors in HNF (1999b) were used in computing dose. These were calculated using the U.S. Environment Protection Agency (EPA) approved CAP-88 Code (EPA 1990).

The TEDE for the unabated emission to the MEI is presented in Table 11-1. The projected dose for each individual radionuclide was calculated by multiplying the projected annual emission (Chapter 10.0, Table 10-2) by the dose conversion factor. The resulting dose is 4.18 E-03 millirem.

The TEDE for the abated emissions to the MEI based on Table 10-2 is presented in Table 11-2. The projected dose for each individual radionuclide is calculated by multiplying the projected annual emission from Table 10-2 by the dose conversion factor. The resulting dose is 5.11 E-04 millirem.

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Table11-1. KE Unabated Emissions and Dose. (2 sheets)

105 KE BASIN TABLE 7.1 SOURCE TERM		Release Fraction	Adjusted Release Fraction	Unabated based on water at (30 uCi/L Cs-137) Emission (Ci)	CAP-88 Dose Conversion Factor (mrem/Ci)	Unabated based on water at (30 uCi/L Cs-137) TEDE to the MEI (mrem/yr)	Dose percent of total
Radionuclide	Inventory (Ci)						
H-3	1.84E+04	6.00E-05	1.00E+00	1.10E+00	4.90E-05	5.41E-05	1.29E+00
C-14	3.62E+02	3.70E-11	1.00E+01	1.34E-07	3.80E-03	5.09E-10	1.22E-05
Fe-55	1.08E+03	3.70E-11	1.00E+01	4.00E-07	4.50E-04	1.80E-10	4.30E-06
Co-60	1.96E+03	3.70E-11	1.00E+01	7.25E-07	4.90E-01	3.55E-07	8.50E-03
Ni-59	2.11E+01	3.70E-11	1.00E+01	7.81E-09	6.10E-04	4.76E-12	1.14E-07
Ni-63	2.31E+03	3.70E-11	1.00E+01	8.55E-07	5.20E-04	4.44E-10	1.06E-05
Se-79	4.35E+01	3.70E-11	1.00E+01	1.61E-08	2.60E-01	4.18E-09	1.00E-04
Kr-85	2.92E+05	6.00E-05	1.00E+00	1.75E+01	1.10E-07	1.93E-06	4.61E-02
Sr-90	5.01E+06	3.70E-11	1.00E+01	1.85E-03	2.20E-01	4.08E-04	9.76E+00
Y-90	5.01E+06	3.70E-11	1.00E+01	1.85E-03	6.80E-04	1.26E-06	3.02E-02
Zr-93	2.01E+02	3.70E-11	1.00E+01	7.44E-08	2.60E-03	1.93E-10	4.63E-06
Nb(m)-93	1.24E+02	3.70E-11	1.00E+01	4.59E-08	4.10E-03	1.88E-10	4.50E-06
Tc-99	1.45E+03	3.70E-11	1.00E+01	5.37E-07	3.50E-04	1.88E-10	4.49E-06
Ru-106	1.84E+03	3.70E-11	1.00E+01	6.81E-07	3.10E-02	2.11E-08	5.05E-04
Rh-106	1.84E+03	3.70E-11	1.00E+01	6.81E-07	8.20E-22	5.58E-28	1.34E-23
Pd-107	8.59E+00	3.70E-11	1.00E+01	3.18E-09	7.40E-04	2.35E-12	5.63E-08
Cd(m)-113	1.84E+03	3.70E-11	1.00E+01	6.81E-07	2.60E-01	1.77E-07	4.23E-03
Sn(m)-121	4.03E+01	3.70E-11	1.00E+01	1.49E-08	1.11E-01	1.66E-09	3.96E-05
Sn-126	8.07E+01	3.70E-11	1.00E+01	2.99E-08	9.30E-02	2.78E-09	6.64E-05
Sb-125	1.88E+04	3.70E-11	1.00E+01	6.96E-06	5.20E-02	3.62E-07	8.65E-03
Sb-126	1.13E+01	3.70E-11	1.00E+01	4.18E-09	6.50E-03	2.72E-11	6.50E-07
Sb(m)-126	8.07E+01	3.70E-11	1.00E+01	2.99E-08	2.35E-06	7.02E-14	1.68E-09
Te(m)-125	4.57E+03	3.70E-11	1.00E+01	1.69E-06	2.00E-03	3.38E-09	8.09E-05
I-129	3.26E+00	6.00E-05	1.00E+00	1.96E-04	2.40E-01	4.69E-05	1.12E+00
Cs-134	7.99E+03	3.70E-11	1.00E+01	2.96E-06	2.00E-01	5.91E-07	1.41E-02
Cs-135	3.96E+01	3.70E-11	1.00E+01	1.47E-08	8.70E-03	1.27E-10	3.05E-06
Cs-137	6.61E+06	3.70E-11	1.00E+01	2.45E-03	5.30E-02	1.30E-04	3.10E+00
Ba(m)-137	6.26E+06	3.70E-11	1.00E+01	2.31E-03	2.40E-09	5.55E-12	1.33E-07
Ce-144	1.09E+03	3.70E-11	1.00E+01	4.03E-07	2.50E-02	1.01E-08	2.41E-04
Pr-144	1.08E+03	3.70E-11	1.00E+01	4.00E-07	4.30E-07	1.72E-13	4.11E-09

Table11-1. KE Unabated Emissions and Dose. (2 sheets)

105 KE BASIN TABLE 7.1 SOURCE TERM		Release Fraction	Adjusted Release Fraction	Unabated based on water at (30 uCi/L Cs-137) Emission (Ci)	CAP-88 Dose Conversion Factor (mrem/Ci)	Unabated based on water at (30 uCi/L Cs-137) TEDE to the MEI (mrem/yr)	Dose percent of total
Radionuclide	Inventory (Ci)						
Pr(m)-144	1.31E+01	3.70E-11	1.00E+01	4.85E-09	2.20E-08	1.07E-16	2.55E-12
Pm-147	2.73E+05	3.70E-11	1.00E+01	1.01E-04	2.10E-03	2.12E-07	5.07E-03
Sm-151	8.95E+04	3.70E-11	1.00E+01	3.31E-05	1.50E-03	4.97E-08	1.19E-03
Eu-152	4.77E+02	3.70E-11	1.00E+01	1.76E-07	4.80E-01	8.47E-08	2.03E-03
Eu154	5.48E+04	3.70E-11	1.00E+01	2.03E-05	3.90E-01	7.91E-06	1.89E-01
Eu-155	1.19E+04	3.70E-11	1.00E+01	4.40E-06	1.60E-02	7.04E-08	1.69E-03
U-234	4.66E+02	3.70E-11	1.00E+01	1.72E-07	6.20E+00	1.07E-06	2.56E-02
U-235	1.77E+01	3.70E-11	1.00E+01	6.55E-09	5.90E+00	3.86E-08	9.24E-04
U-236	6.61E+01	3.70E-11	1.00E+01	2.45E-08	5.80E+00	1.42E-07	3.39E-03
U-238	3.80E+02	3.70E-11	1.00E+01	1.41E-07	5.50E+00	7.73E-07	1.85E-02
Np-237	3.02E+01	3.70E-11	1.00E+01	1.12E-08	2.30E+01	2.57E-07	6.15E-03
Pu-238	6.07E+04	3.70E-11	1.00E+01	2.25E-05	1.50E+01	3.37E-04	8.06E+00
Pu-239	1.15E+05	3.70E-11	1.00E+01	4.26E-05	1.60E+01	6.81E-04	1.63E+01
Pu-240	6.38E+04	3.70E-11	1.00E+01	2.36E-05	1.60E+01	3.78E-04	9.04E+00
Pu-241	2.60E+06	3.70E-11	1.00E+01	9.62E-04	2.60E-01	2.50E-04	5.98E+00
Pu-242	3.07E+01	3.70E-11	1.00E+01	1.14E-08	1.60E+01	1.82E-07	4.35E-03
Am-241	2.03E+05	3.70E-11	1.00E+01	7.51E-05	2.50E+01	1.88E-03	4.49E+01
Am-242	1.14E+02	3.70E-11	1.00E+01	4.22E-08	2.50E-03	1.05E-10	2.52E-06
Am(m)-242	1.14E+02	3.70E-11	1.00E+01	4.22E-08	2.40E+01	1.01E-06	2.42E-02
Am-243	7.12E+01	3.70E-11	1.00E+01	2.63E-08	2.50E+01	6.59E-07	1.58E-02
Cm-242	2.00E+00	3.70E-11	1.00E+01	7.40E-10	8.20E-01	6.07E-10	1.45E-05
Cm-244	8.84E+02	3.70E-11	1.00E+01	3.27E-07	1.30E+01	4.25E-06	1.02E-01
Total	2.67E+07			1.86E+01		4.18E-03	1.00E+02

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Table 11-2. KE Abated Emissions and Dose. (2 sheets)

105 KE BASIN TABLE 7.1 SOURCE TERM		Release Fraction	Abated based on water at (3 uCi/L CS-137) Emission (Ci)	CAP-88 Dose Conversion Factor (mrem/Ci)	Abated based on water at (3 uCi/L Cs-137) TEDE to the MEI (mrem/yr)	Dose percent of total
Radionuclide	Inventory (Ci)					
H-3	1.84E+04	6.00E-05	1.10E+00	4.90E-05	5.41E-05	1.06E+01
C-14	3.62E+02	3.70E-11	1.34E-08	3.80E-03	5.09E-11	9.96E-06
Fe-55	1.08E+03	3.70E-11	4.00E-08	4.50E-04	1.80E-11	3.52E-06
Co-60	1.96E+03	3.70E-11	7.25E-08	4.90E-01	3.55E-08	6.95E-03
Ni-59	2.11E+01	3.70E-11	7.81E-10	6.10E-04	4.76E-13	9.32E-08
Ni-63	2.31E+03	3.70E-11	8.55E-08	5.20E-04	4.44E-11	8.70E-06
Se-79	4.35E+01	3.70E-11	1.61E-09	2.60E-01	4.19E-10	8.19E-05
Kr-85	2.92E+05	6.00E-05	1.75E+01	1.10E-07	1.93E-06	3.77E-01
Sr-90	5.01E+06	3.70E-11	1.85E-04	2.20E-01	4.08E-05	7.98E+00
Y-90	5.01E+06	3.70E-11	1.85E-04	6.80E-04	1.26E-07	2.47E-02
Zr-93	2.01E+02	3.70E-11	7.44E-09	2.60E-03	1.93E-11	3.78E-06
Nb(m)-93	1.24E+02	3.70E-11	4.59E-09	4.10E-03	1.88E-11	3.68E-06
Tc-99	1.45E+03	3.70E-11	5.37E-08	3.50E-04	1.88E-11	3.67E-06
Ru-106	1.84E+03	3.70E-11	6.81E-08	3.10E-02	2.11E-09	4.13E-04
Rh-106	1.84E+03	3.70E-11	6.81E-08	8.20E-22	5.58E-29	1.09E-23
Pd-107	8.59E+00	3.70E-11	3.18E-10	7.40E-04	2.35E-13	4.60E-08
Cd(m)-113	1.84E+03	3.70E-11	6.81E-08	2.60E-01	1.77E-08	3.46E-03
Sn(m)-121	4.03E+01	3.70E-11	1.49E-09	1.11E-01	1.66E-10	3.24E-05
Sn-126	8.07E+01	3.70E-11	2.99E-09	9.30E-02	2.78E-10	5.43E-05
Sb-125	1.88E+04	3.70E-11	6.96E-07	5.20E-02	3.62E-08	7.08E-03
Sb-126	1.13E+01	3.70E-11	4.18E-10	6.50E-03	2.72E-12	5.32E-07
Sb(m)-126	8.07E+01	3.70E-11	2.99E-09	2.35E-06	7.02E-15	1.37E-09
Te(m)-125	4.57E+03	3.70E-11	1.69E-07	2.00E-03	3.38E-10	6.62E-05
I-129	3.26E+00	6.00E-05	1.96E-04	2.40E-01	4.69E-05	9.19E+00
Cs-134	7.99E+03	3.70E-11	2.96E-07	2.00E-01	5.91E-08	1.16E-02
Cs-135	3.96E+01	3.70E-11	1.47E-09	8.70E-03	1.27E-11	2.49E-06
Cs-137	6.61E+06	3.70E-11	2.45E-04	5.30E-02	1.30E-05	2.54E+00
Ba(m)-137	6.26E+06	3.70E-11	2.31E-04	2.40E-09	5.55E-13	1.09E-07
Ce-144	1.09E+03	3.70E-11	4.03E-08	2.50E-02	1.01E-09	1.97E-04
Pr-144	1.08E+03	3.70E-11	4.00E-08	4.30E-07	1.72E-14	3.36E-09
Pr(m)-144	1.31E+01	3.70E-11	4.85E-10	2.20E-08	1.07E-17	2.09E-12
Pm-147	2.73E+05	3.70E-11	1.01E-05	2.10E-03	2.12E-08	4.15E-03

Table 11-2. KE Abated Emissions and Dose. (2 sheets)

105 KE BASIN TABLE 7.1 SOURCE TERM		Release Fraction	Abated based on water at (3 uCi/L CS-137) Emission (Ci)	CAP-88 Dose Conversion Factor (mrem/Ci)	Abated based on water at (3 uCi/L Cs-137) TEDE to the MEI (mrem/yr)	Dose percent of total
Radionuclide	Inventory (Ci)					
Sm-151	8.95E+04	3.70E-11	3.31E-06	1.50E-03	4.97E-09	9.72E-04
Eu-152	4.77E+02	3.70E-11	1.76E-08	4.80E-01	8.47E-09	1.66E-03
Eu154	5.48E+04	3.70E-11	2.03E-06	3.90E-01	7.91E-07	1.55E-01
Eu-155	1.19E+04	3.70E-11	4.40E-07	1.60E-02	7.04E-09	1.38E-03
U-234	4.66E+02	3.70E-11	1.72E-08	6.20E+00	1.07E-07	2.09E-02
U-235	1.77E+01	3.70E-11	6.55E-10	5.90E+00	3.86E-09	7.56E-04
U-236	6.61E+01	3.70E-11	2.45E-09	5.80E+00	1.42E-08	2.78E-03
U-238	3.80E+02	3.70E-11	1.41E-08	5.50E+00	7.73E-08	1.51E-02
Np-237	3.02E+01	3.70E-11	1.12E-09	2.30E+01	2.57E-08	5.03E-03
Pu-238	6.07E+04	3.70E-11	2.25E-06	1.50E+01	3.37E-05	6.59E+00
Pu-239	1.15E+05	3.70E-11	4.26E-06	1.60E+01	6.81E-05	1.33E+01
Pu-240	6.38E+04	3.70E-11	2.36E-06	1.60E+01	3.78E-05	7.39E+00
Pu-241	2.60E+06	3.70E-11	9.62E-05	2.60E-01	2.50E-05	4.89E+00
Pu-242	3.07E+01	3.70E-11	1.14E-09	1.60E+01	1.82E-08	3.56E-03
Am-241	2.03E+05	3.70E-11	7.51E-06	2.50E+01	1.88E-04	3.67E+01
Am-242	1.14E+02	3.70E-11	4.22E-09	2.50E-03	1.05E-11	2.06E-06
Am(m)-242	1.14E+02	3.70E-11	4.22E-09	2.40E+01	1.01E-07	1.98E-02
Am-243	7.12E+01	3.70E-11	2.63E-09	2.50E+01	6.59E-08	1.29E-02
Cm-242	2.00E+00	3.70E-11	7.40E-11	8.20E-01	6.07E-11	1.19E-05
Cm-244	8.84E+02	3.70E-11	3.27E-08	1.30E+01	4.25E-07	8.32E-02
Total	2.67E+07		1.86E+01		5.11E-04	1.00E+02

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12.0 FACILITY LIFETIME (REQUIREMENT 17)

The construction activities associated with the modifications described in this NOC modification are scheduled to begin in calendar year 2001. Fuel elements will begin to be retrieved during calendar year 2002 and removal will be completed within a two-year period. Sludge removal will start in calendar year 2002 and will be covered by a Comprehensive Environmental Response, Compensation, and Liability Act Radiological Air Monitoring Plan. The date for completing the removal of SNF, sludge, debris and water is planned for July 31, 2007 per Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Ecology et al. 1996) and amendments.

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13.0 TECHNOLOGY STANDARDS (REQUIREMENT 18)

The technology standards listed in WAC 246-247-120 for BARCT and WAC 246-247-130 for ALARACT are to be met only to the extent justified by cost benefit evaluation as the PTE described in Section 11 is less than 0.1 mrem/yr.. The technology standards for the most part pertain to emission control systems for gaseous and particulate releases. Since the BARCT assessment described in Appendix A showed installing HEPA filtration in the 105 KE Basin was not cost effective, many of these standards are not applicable. The following is a more detailed assessment for each technology standard.

- ASME/ANSI AG-1, Code on Nuclear Air and Gas Treatment

  This deals with gaseous and particulate releases to a facility air stream which is not applicable to the 105 KE Basin as BARCT does not include HEPA filtration

- ASME/ANSI N509, Nuclear Power Plant Air Cleaning Units and Components

  This deals with gaseous and particulate releases to a facility air stream which is not applicable to the 105 KE Basin as BARCT does not include HEPA filtration

- ASME/ANSI N510, Testing of Nuclear Air Treatment Systems

  This deals with gaseous and particulate releases to a facility air stream which is not applicable to the 105 KE Basin as BARCT does not include HEPA filtration

- ANSI/ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities, and NQA-2, Quality Assurance Requirements for Nuclear Facilities

  ANSI/ASME NQA-1 and NQA-2, quality assurance program requirements for nuclear facility applications. The design and operation of 105 KE will be in conformance with 10 CFR 830.120. The implementation plan to these codified quality assurance requirements describe in detail which portions of the same standard are applicable and carried forward into design and operation.

- 40 CFR 60, Appendix A

  Method 1, Sample and Velocity Traverses for Stationary Sources

  Not applicable as the emissions monitoring uses fixed head samplers at the roof vents approved by DOH on October 5, 1992, AIR-92-107.

  Method 1A, Sample and Velocity Traverses for Stationary Sources with Small Stacks or Ducts

  Not applicable as the emissions monitoring uses fixed head samplers at the roof vents approved by DOH on October 5, 1992, AIR-92-107.

Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S pitot tube)

Exhaust flow rates were field measured. See AIR-92-107, dated October 5, 1992

Method 2A, Direct Measurement of Gas Volume Through Pipes and Small Ducts

Exhaust flow rates were field measured. See AIR-92-107, dated October 5, 1992

Method 2C, Determination of Stack Gas Velocity and Volumetric Flow Rate in Small Stacks on Ducts (standard pitot tube)

Exhaust flow rates were field measured. See AIR-92-107, dated October 5, 1992

Method 2D, Measurement of Gas Volumetric Flow Rates in Small Pipes and Ducts

Exhaust flow rates were field measured. See AIR-92-107, dated October 5, 1992

Method 4, Determination of Moisture Content in Stack Gases

Determination of moisture content in the basin vents is not necessary for the manner in which emissions are estimated

Method 5, Determination of Particulate Emissions from Stationary Sources

Exhaust flow rates were field measured. See AIR-92-107, dated October 5, 1992

- ANSI N13.1, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities

Not applicable as the emissions monitoring uses fixed head samples at the roof vents approved by DOH on October 5, 1992, AIR-92-107.

- ANSI N42.18, Specification and Performance of On-Site Instrumentation for Continuously Monitoring Radioactivity in Effluents.

The emissions from the basins are not required to be continuously monitored.

- ERDA-76-21, Nuclear Air Cleaning Handbook

This deals with gaseous and particulate releases to a facility air stream which is not applicable to the 105 KE Basin as BARCT does not include HEPA filtration

- ACGIH 1988, Industrial Ventilation

This deals with gaseous and particulate releases to a facility air stream which is not applicable to the 105 KE Basin as BARCT does not include HEPA filtration.

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APPENDIX A

DISCUSSION OF AS LOW AS REASONABLY ACHIEVABLE CONTROL TECHNOLOGY

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APPENDIX A

DISCUSSION OF AS LOW AS REASONABLY ACHIEVABLE CONTROL TECHNOLOGY

As stated in Washington Administrative Code (WAC) 246-247-040(4), "All existing emission units and nonsignificant modifications shall utilize ALARACT..." By definition, the proposed modification is "nonsignificant." As stated in WAC 246-247-030(6), in part, "Control technology that meets BARCT requirements also meets ALARACT requirements."

A best available radionuclide control technology assessment (BARCT) (WHC 1993a) was prepared for the 105 K East (KE) Basin encapsulation activity. The BARCT assessment studied the economic impacts of installing several high efficiency particulate air (HEPA) filtration systems in the 105 KE Basin. The BARCT assessment revealed that installing HEPA filtration on the 105 KE Basin was not cost effective.

In a September 13, 1993 letter to U.S. Department of Energy, Richland Operations Office, the Washington State of Washington Department of Health (DOH) agreed (subject to specific conditions) that the water in the K Basins would be accepted as BARCT for the control of airborne radionuclides (DOH 1993).

Therefore, it is concluded that the basin water treatment systems, described in Sections 6.3 and 8.4, are as low as reasonably achievable control technology for the proposed activity.

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APPENDIX B

105 KE AND 105 KW

FUEL STORAGE BASINS

ALARACT DEMONSTRATION

FOR

RECEIPT AND STORAGE OF F AND H REACTOR FUEL

Consists of 6 pages
including cover

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APPENDIX B

3/15/01

105 KE and 105 KW Fuel Storage Basins ALARACT Demonstration for Receipt and Storage of F and H Reactor Fuel

The purpose of this As Low As Reasonably Achievable Control Technology (ALARACT) demonstration for the receipt and storage, in either the 105 K East (KE) or 105 K West (KW) Basin, of spent nuclear fuel (SNF) that may be found during the cleanout of the F and H Reactor Basins, is to: (1) demonstrate that the potential-to-emit (PTE) is significantly under 0.1 mrem/year to the maximally exposed individual (MEI); (2) demonstrate the means that will be used to control radioactive emissions to achieve emission levels that are consistent with ALARA: and (3) obtain approval from Washington State of Washington Department of Health (DOH) that this action is exempt from the requirements of Washington Administrative Code (WAC)-246-247-060 and –075 per WAC 246-247-020(c), as described in more detail below.

The amount of SNF that potentially exists in the F and H Reactor Basins that will be added to the K Basins SNF inventory is 150 pounds, as compared to the 2100 metric tons of SNF stored in the 105 KE and 105 KW Basins. This 150 pounds is 3.2E-3 percent of the present SNF inventory in the K Basins.

The subject emission units/project is the 105 KE and 105 KW Fuel Storage Basins and the action, described below, for which this ALARACT demonstration is submitted is part of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) interim removal action, as described in the Record of Decision (ROD) for the 100-KR-2 operable unit, U.S. Environmental Protection Agency (EPA) ID # WA3890090076, dated September 22, 1999. The SNF, which may be found during the cleanout of the F and H Reactor Basins, will be transferred to either the 105 KE or 105 KW Fuel Storage Basins based on basin operations at the time of transfer. The cleanout of the F and H Reactor Basins is being performed under a CERCLA ROD.

The removal work at the F and H Reactor Basins is planned to take place in the summer of calendar year 2001.

Background

Hanford Site single-pass reactor (SPR) SNF was removed from the F and H Reactor fuel storage basins (F and H Basins) over 30 years ago, following the cessation of irradiation operations at those reactors. Based on the experienced gained from other Hanford reactor decommissioning activities, it is anticipated that several fuel elements or element pieces may be found that were inadvertently left behind after fuel removal. It is projected that up to five or more fuel elements or element pieces may be found in each of the F and H Basins. Any SNF elements or pieces found during basin cleanout will be retrieved and transported to the 105 K fuel storage basins (K Basins) for storage and final disposition. No more than 150 pounds of SNF is anticipated during this campaign.

At the F and H Basins, SNF elements and/or element pieces will be placed in lead-shielded sludge sample containers (hereinafter referred to as sample containers) and will subsequently be packaged for shipment to the K Basins in a PAS-1 cask shown in Figure 1. The PAS-1 cask is dually certified by the U.S. Nuclear Regulatory Commission (NRC) under Certification of Compliance (CoC) USA/9184/B(U)(NRC 2000) and the U.S. Department of Energy (DOE) under CoC USA/9184/B(U)(DOE 2000).

Under the NRC/DOE CoCs, the PAS-1 cask is licensed for the shipment of Type B quantities of radioactive liquids (up to 4L) in commerce. The PAS-1 cask has also been used at Hanford for onsite shipments of other payloads (e.g. K Basin SNF sludge).

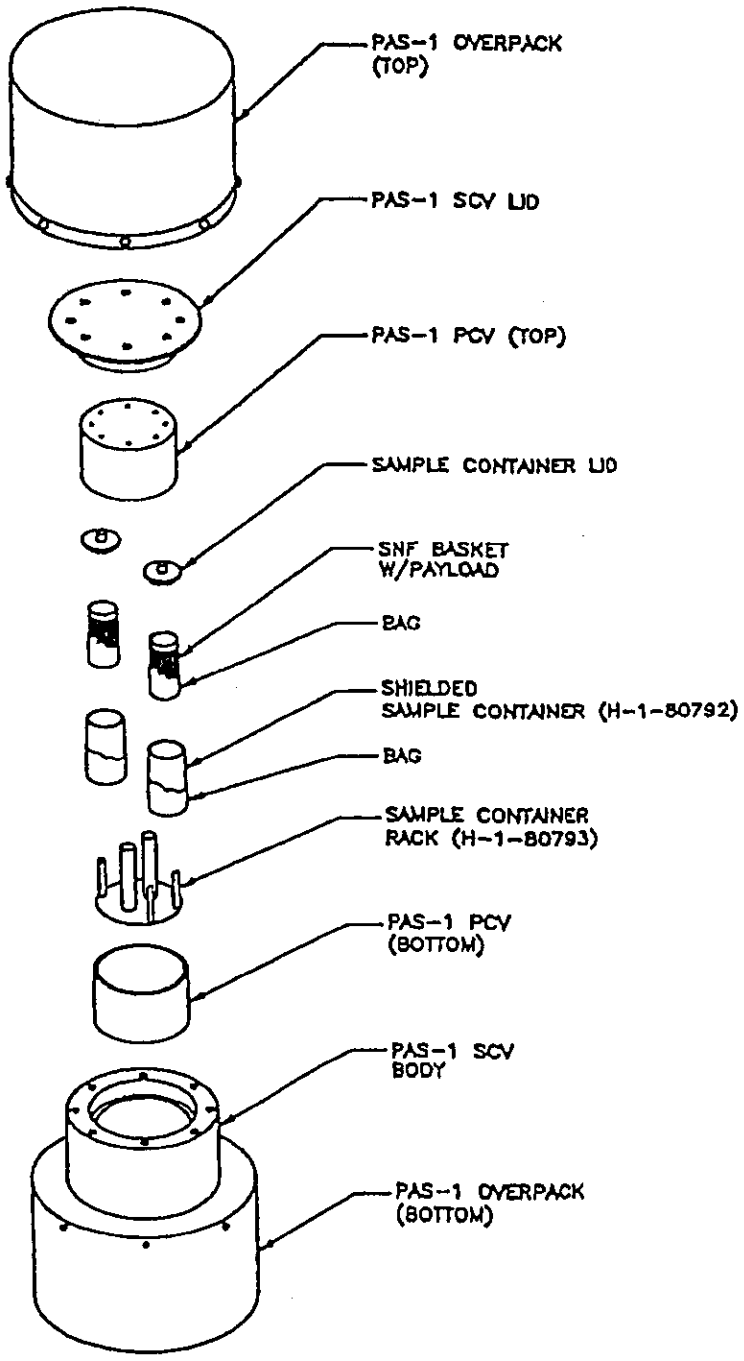
The PAS-1 cask will be transported to either the 105 KE or 105 KW fuel storage basins based on operational activities occurring at the time of shipment. Upon receipt at either basin, the cask will be opened and the closed lead-shielded sample container, containing SNF elements and/or element pieces, will be removed from the cask and placed underwater in the basin. From that point, the closed lead-shielded sample container will be opened underwater and the contents will be transferred to an empty canister for storage in the basins. The empty lead-shielded sample container will be removed from the basin, rinsed and bagged using the same controls being used for removing K Basin debris described in the 105 KE and 105 KW Basin Fuel Removal Notices of Construction (NOCs). (DOE/RL-96-101, Rev. 0, and DOE/RL-97-28, Rev 0A).

A PTE for this activity was estimated following the approach in 40 Code of Federal Regulation 61 Appendix D. The PTE and the annual possession quantity are shown in Table 1. The PTE was calculated as 8.71 E-5 mrem/year, which took no credit for the closed lead-shield sample container or the basin water. For comparative purposes, the PTE associated with the removal of SNF from the 105 KE and 105 WK Basins is:

105 KE Basin [1]	2.81 E-3 mrem/yr.
105 KW Basin [2]	4.17 E-2 mrem/yr.

(1) DOE/RL-96-101, Rev. 0
(2) DOE/RL-97-28, Rev. 0A

PAS-1 Cask for F and H Basin Spent Nuclear Fuel Payload.



ESTIMATED PTE OF F & H REACTOR FUEL TO BE STORED IN 105 K-BASIN

Radio-nuclide	Single Element Inventory (Ci)	Total Annual Possession Quantity (Ci/yr)	Release Fraction (solid fuel)	Unabated Annual Emission (Ci/yr)	100 K-Area Unit Dose Factors (mrem/Ci)	Unabated Offsite Dose (mrem/yr)
Am-241	7.83E-02	7.83E-01	1.00E-06	7.83E-07	2.50E+01	1.96E-05
Ba-137m	5.61E+00	5.61E+01	1.00E-06	5.61E-05	2.40E-09	1.35E-13
Cd-113	4.00E-04	4.00E-03	1.00E-06	4.00E-09	2.60E-01	1.04E-09
Cs-137	5.93E+00	5.93E+01	1.00E-06	5.93E-05	5.30E-02	3.14E-06
Eu-152	3.03E-05	3.03E-04	1.00E-06	3.03E-10	4.80E-01	1.45E-10
Kr-85	1.72E-01	1.72E+00	1.00E-06	1.72E-06	1.10E-07	1.89E-13
Nb-94	1.60E-04	1.60E-03	1.00E-06	1.60E-09	1.60E+00	2.56E-09
Pd-107	4.00E-06	4.00E-05	1.00E-06	4.00E-11	7.40E-04	2.96E-14
Pu-238	3.61E-03	3.61E-02	1.00E-06	3.61E-08	1.50E+01	5.42E-07
Pu-239	2.40E-01	2.40E+00	1.00E-06	2.40E-06	1.60E+01	3.84E-05
Pu-240	6.00E-02	6.00E-01	1.00E-06	6.00E-07	1.60E+01	9.60E-06
Pu-241	1.07E+00	1.07E+01	1.00E-06	1.07E-05	2.60E-01	2.78E-06
Se-79	4.00E-05	4.00E-04	1.00E-06	4.00E-10	2.60E-01	1.04E-10
Sm-151	7.21E-02	7.21E-01	1.00E-06	7.21E-07	1.50E-03	1.08E-09
Sr-90	5.85E+00	5.85E+01	1.00E-06	5.85E-05	2.20E-01	1.29E-05
Tc-99	2.00E-01	2.00E+00	1.00E-06	2.00E-06	4.50E-02	9.00E-08
U-238	1.20E-03	1.20E-02	1.00E-06	1.20E-08	5.50E+00	6.60E-08
Y-90	5.85E+00	5.85E+01	1.00E-06	5.85E-05	6.80E-04	3.98E-08
Zr-93	4.00E-04	4.00E-03	1.00E-06	4.00E-09	2.60E-03	1.04E-11
Totals	2.51E+01	2.51E+02		2.51E-04		8.71E-05

Notes:

Single-element activity inventory decayed to 3/1/98 is taken from BHI-01428 Rev. 0, Appendix A

Annual possession quantity is based on 10 fuel elements (BHI-01428 Rev. 0, Section 3.4)

Release fraction assumes solid fuel pieces; no abatement credit is taken for the water cover in the basin or the containment canister

Conservative dose factors (release height < 40-m) are taken from HNF-3602 Vol. 1

APPENDIX C

ALARACT DEMONSTRATION FOR THE 105 KE CONCRETE PAD REMOVAL

Consists of 8 pages
including cover

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APPENDIX C

ALARACT DEMONSTRATION FOR THE 105 KE CONCRETE PAD REMOVAL

To:

Joe Escamillo, A4-79
Paul Krupin, A5-15
Dave Watson, X3-79
Jerry Hunacek, X3-79
John Bates, G1-30
Nina Menard, G1-30
Barry Cum, G1-30

Subject: ALARACT Demonstration for the 105 KE Concrete Pad Removal

Attached is a copy of the signed ALARACT Demonstration for the 105 KE Concrete Pad Removal. The removal of the pad was originally brought to the RTAM as a NOC Revision. After some discussion, DOH indicated that it would more appropriately be submitted as an ALARACT Demonstration.

Larry Gadbois of the EPA was contacted to ensure that this meets his needs for management of the CERCLA Action. His only concern was the potential for water used in dust control to move contamination from the soil into the groundwater. The ALARACT Demonstration was revised to indicate that run-off or ponding on adjacent soils would not be allowed. Larry Gadbois reviewed the revision and indicated that it was sufficient.

On February 20, 2001, Randy Acselrod signed the ALARACT Demonstration. He kept a copy for the DOH files and for a discussion with Al Conklin later that afternoon. A copy was also delivered to Larry Gadbois, EPA for his files.

If you have any questions regarding the above information, please do not hesitate to contact me.

Carole Rodriguez

105 KE Fuel Storage Basin
ALARACT Demonstration
IWTS Concrete Pad Removal
February 9, 2000

The purpose of this As Low As Reasonably Achievable Control Technology (ALARACT) demonstration for the removal of a concrete pad north of the 105 KE Fuel Storage Basin is to demonstrate: (1) a potential-to-emit significantly under 0.1 mrem/year to the MEI; (2) the means which will be used to control radioactive emissions that achieves emission levels that are consistent with ALARA; and (3) obtain approval from DOH that this action is exempt from the requirements of WAC-246-247-060 and –075 per WAC 246-247-020(c), as described in more detail below.

The subject emission unit/project is the 105 KE Fuel Storage Basin and the action described below for which this ALARACT demonstration is submitted for is a part of a CERCLA interim removal action as described in the Record of Decision for the 100-KR-2 operable unit, EPA ID #WA3890090076, dated September 22, 1999.

The removal of this concrete pad is tied to the construction of the 105KE Basin Integrated Water Treatment System (IWTS) and is not unique to any facility modifications for the Alternate Fuel Transfer Strategy (AFTS). Construction is planned to start February 27, 2001.

BACKGROUND

The concrete pad to be removed is located to the north of the 105 KE Fuel Storage Basin. Demolition debris will be shipped to the Environmental Restoration Disposal Facility (ERDF) for disposal. A portion of the existing pad was part of the original reactor construction in 1952, with the remainder of the pad added in 1994. Between 1994 and 1999 the pad was used for storage of low-level waste. Currently, this pad has radiological fixed/non-smearable contamination. The source of the contamination is assumed to be from past 105 KE Basin operations involving the staging of radiologically contaminated equipment and waste. Figure 1 shows the pad construction area.

There is a potential for radioactive airborne emissions associated with the removal of the existing concrete pad. A radiological survey was performed on the pad to quantify the fixed radioactivity. The contamination consists of non-smearable beta/gamma contamination. Readings ranged from less than detectable to 1,000,000-dpm/100 cm^2 total for beta/gamma radiation.

The measured surface activity represents the radiological source term. This activity was used to calculate the annual possession quantity which was in turn used to calculate the potential-to-emit.

The potential-to-emit (PTE) associated with the concrete pad removal is given in Table 1. The MEI is located 6.14 miles west of the 100 Area. The PTE was calculated based on measured Cs-137 activity (dpm/100 cm^2) on each of 325 segments of the 40 ft. by 75 ft. pad to be removed. Each segment measures 9 square feet. Total Cs-137 activity was estimated by summing the activities of each of the 325 segments.

To estimate the other nuclide activities, it was assumed that the pad fixed/non-smearable contamination was from a 105KE Basin water spill. Assuming the relative ratio of Cs-137 on the pad to other nuclides is the same as in basin water, the activities of the other nuclides shown in Table 1 were calculated.

The dose conversion factors used were derived from the CAP-88 Code. The projected dose for each individual nuclide is calculated by multiplying the projected annual emission by the dose conversion factor. The resulting PTE dose calculation provides a conservative result of 2.45E-07 mrem/yr. To count for any soil contamination this number has been multiplied by 3. The resulting PTE dose is 7.35E-07 mrem/yr.

The radiological contamination that is present in the existing concrete pad is considered fixed by virtue of it being entrapped in the concrete and by the coating that has been applied to the surface of the concrete pad.

Methods associated with the removal of the concrete pad will involve the use of a backhoe or other mechanical methods to remove the existing concrete and to excavate and compact the soil for foundation construction. Water may also be used as a means of dust suppression if required, however any run-off or ponding on adjacent soils will not be allowed pursuant to State Waste Discharge Permit 4508.

The controls which will be used to minimize the potential for any radiological airborne contamination will entail placement of demolition rubble in coverable drag-off boxes that are used on site to ship waste to ERDF for disposal.

Monitoring will be performed by an existing ambient air monitoring network around the 105 KE Basin.

Exemptions:

Pursuant to WAC 246-247-020, the following are exemptions which are being requested and their bases:

WAC 246-247-060, applications, registration and licensing

This activity is a CERCLA interim response action and is excluded from inclusion in the air operating permit administered under WAC 173-401 per 42 U.S.C. 9621, Paragraph (e).

1) Submittal of NOC. An exemption from this requirement is based both on the PTE and exclusion of CERCLA actions from administrative permitting requirements per 42 U.S.C. 9621, Paragraph (e).

2) Requirements for modifications of unregistered emission units. An exemption from this requirement is based on the fact that K Basins is a registered emission unit.

3) Submittal requirements for facilities in violation of any standards contained in WAC 246-247-040. An exemption from this requirement is based on the fact

there are no violations to the referenced standards at K Basins as evidenced in DOE/RL-96-101 and DOH's AIR 97-206.

4) Notification of any pre-operational tests. An exemption to this requirement is based on the fact there are no pre-operational tests associated with the concrete pad removal.

5) The license shall specify ... The facility shall comply ... An exemption from this requirement is based on the fact that a unique license will not be issued for the concrete pad removal based as Hanford is operating under one license.

6) Licenses shall have an expiration date of 5 years... An exemption from this requirement is based on the fact that a unique license will not be issued for the concrete pad removal.

WAC 246-247-075, Monitoring, Testing, and Quality Assurance

2) Equipment and procedures used for continuous monitoring shall conform as applicable to ... An exemption to this requirement is based on the low PTE of the concrete pad removal and the utilization of an existing ambient air monitoring network at the facility.

Reviewed by Contractor	Reviewed by RL	Approved by DOH
2/9/01	2/14/01	2/20/2001
2/9/01		

Figure 1 . 105KE IWTS Annex Facility

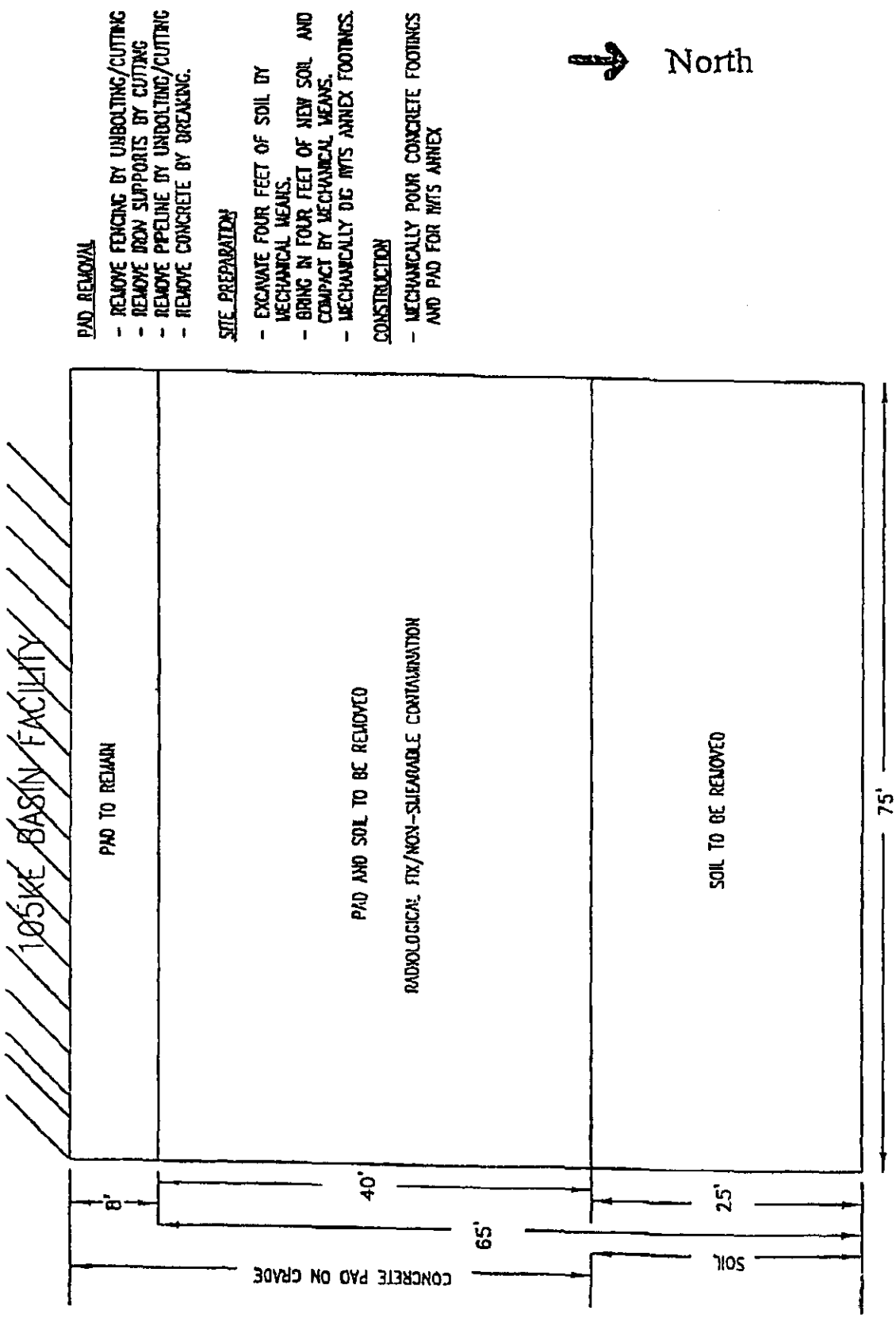

Table 1. Total Effective Dose Equivalent to the Maximally Exposed Individual Using Projected Emissions Based on Best Engineering Judgement and Emissions Dated for the Unabated Emissions for the Concrete Pad Removal North of the 105KE Fuel Storage Basin

Radionuclide	Calculated Activity (Ci)	Unabated* Release (Ci/yr)	CAP88 Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)
Am241	1.61E-06	1.61E-09	1.94E+01	3.12E-08
Cs134	5.36E-07	5.36E-10	4.60E-02	2.47E-11
Cs137	9.06E-04	9.06E-07	3.53E-02	3.20E-08
Co60	5.36E-07	5.36E-10	4.28E-02	2.29E-11
Eu152	1.07E-06	1.07E-09	2.27E-02	2.43E-11
Eu154	5.36E-07	5.36E-10	2.69E-02	1.44E-11
Eu155	1.61E-06	1.61E-09	4.90E-02	7.88E-11
Pu238	4.29E-06	4.29E-09	1.18E+01	5.06E-08
Pu239/240	7.50E-06	7.50E-09	1.28E+01	9.60E-08
Sr90	5.41E-04	5.41E-07	6.45E-02	3.49E-08
H3	8.03E-04	8.03E-07	3.36E-05	2.70E-11
Total	2.27E-03			2.45E-07
				7.35E-07**

* Assume that the release fraction of nuclide for removal of the pad is 1.0E-3. This will give an unabated annual emission in Ci/yr.

** To account for any potential soil contamination the unabated dose for the pad removal was multiplied by 3 to account for any contaminated soil that may be encountered.

Ci = curies
Ci/yr = Curies per year
mrem/Ci = millirem per curie
mrem/yr = millirem per year

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